A COMPARISON OF THE EFFECTS OF A LAND OR WATER BASED COMMUNITY EXERCISE CLASS ON THE FUNCTIONAL CAPACITY OF WOMEN WITH ARTHRITIS

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Presented to

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Physical Education and Recreation

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In Partial Fulfillment

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Master of Arts in

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by

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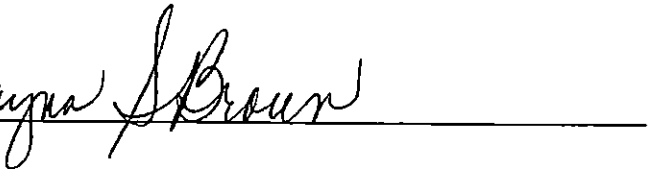
Director of Thesis: 

Purpose: The purpose of this study was to examine and compare the effects of a non-clinical community water based exercise program and a land based exercise program (Body Recall) on flexibility and functional capacity in arthritic women ages 18 - 75.

Procedure: Sixteen female subjects, mean age was 50.56 years, diagnosed with arthritis, volunteered to participate in this study. Four who could not commit to the exercise became the controls while the others were randomly assigned to either the water exercise or Body Recall groups. The exercise classes met three times a week for 8 weeks. Pre- and post tests consisted of resting heart rate, resting blood pressure, height, weight, percent body fat, Cooper 12 Minute Run - Walk test, The Stanford Functional Capacity Scorecard, the AAHPERD sit and reach test, the shoulder- wrist elevation test, the trunk and neck extension test, the shoulder rotation test, the ankle extension (plantar flexion) test, and the ankle flexion (dorsiflexion) test. Data were analyzed using ANCOVA. Multiple comparisons to determine significant difference between individual groups were performed with the Bancroft test. Individual improvements were analyzed using a paired two-sample t-test.

Findings: A post exercise significant difference in shoulder rotation was found comparing exercise groups and the control group. After Bancroft Analysis, a mean difference was found significant at the 0.05 level in the controls and significant at the 0.01 level for the water aerobics and Body Recall groups. No significant differences were found between the exercise groups and the control group in Sit & Reach, shoulder - wrist elevation, ankle dorsiflexion, right ankle plantar flexion, left ankle plantar flexion, trunk and neck extension, resting heart rate, resting diastolic blood pressure, height, weight, grip strength, body fat, Cooper 12 Minute Run - Walk test, and survey.

In the Body Recall group, significant absolute flexibility improvements were found in all areas. Significant pre to post test improvements were also found in left and right grip strength, the Cooper 12 Minute Run-Walk test, in the survey overall total answers. A significant increase also was found in percent body fat.

In comparing the pre and post exercise for the Water Aerobics group, significant absolute flexibility improvements were found in sit and reach, left toe plantar flexion, left and right grip strength, trunk and neck extension and shoulder and wrist elevation. A significant decrease of right toe plantar flexion was found, along with a significant decrease of performance in the Cooper 12 Minute Run - Walk test. No change was shown in shoulder rotation or ankle plantar flexion.

Conclusions: 1). In this study, the null hypothesis was accepted in every case except one: shoulder rotation. Eight weeks of exercise did not provide a significant measurable pre and post improvements when the exercise groups were compared to each other and to the control group. 2). All exercisers reported a perceived increase in functional capacity, through an increase in pain free movement. 3). Eight weeks of exercise did provide some pre and post improvements in the individual exercise groups.

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Introduction

Problem

Arthritis is a debilitating and sometimes a very painful disease. It inhibits movement by limiting range of motion about joints and can lead to depression and possibly add to declining health. (Ettinger & Afable, 1994). Flare ups may occur regularly or occasionally. Originally, rest and medication were the only forms of rehabilitation offered. Now, exercise is being prescribed as a treatment, with the hopes of lessening the pain, increasing mobility and joint range of motion as well as contributing to a healthy lifestyle. (Bunning & Materson, 1991). While many doctors recommend exercise for their arthritic patients, only about 2% seek physical therapy. (Fisher, Kame, Rouse & Pendeergast,1994). Phyllis Dexter found that only 7% of her 110 elderly subjects in community based exercise programs received optimal exercise related care. (Dexter, 1991). Community classes are more prevalent, and are offered through YMCA's, churches, colleges and community recreational facilities. They also have a tendency to cost less than physical therapy.

Community classes seem to be the route many arthritis victims turn to for exercise. However, most of the data collected justifying the benefits of exercise has not evaluated community programming. (Ytterberg, Mahowald, & Krug,1994, Meyer & Hawley, 1994). Much of the published research utilizes clinical and controlled research, not community oriented programming. With medical costs on the increase, and the onset of increased Medicare problems, physicians need to be able to make realistic and cost effective exercise treatments available to their patients. Under the guidance of properly trained individuals, community or recreational exercise programs would seem to provide

ample opportunity for arthritis sufferers to seek affordable exercise treatment and to improve their health.

The purpose of this study was to examine and compare the effects of a non-clinical community water based exercise program and a land based exercise program (Body Recall) on flexibility and functional capacity in arthritic women ages 18 - 75.

Background

Arthritis is a disease that affects the joints of the body. Degeneration of the joint, bones and the surrounding muscles are some of the physiopathic results of this disease. Over 15-37 million adults are currently afflicted with over 127 various forms of arthritis, (Ettinger & Afable, 1994; Gordon, 1993) with osteoarthritis being the most common. (Ettinger & Afable, 1994). Every year, it is estimated that arthritis costs 6.5 billion dollars in lost wages. (Semble, 1995). Arthritis may start as an annoyance, but it can evolve into an incapacitating disease. (Gordon, 1993). When it strikes, individuals lose functional capacity, flexibility and joint range of motion. This in turn limits movement and the ability to perform daily activities. These losses contribute to the degradation of a person's health and quality of life. However, exercise and stretching regimens have been found to reverse these effects, allowing suffers to regain lost functional capacities.

Physicians have recently begun to recommend exercise as a treatment for arthritis; however, it has been found that doctors are still very cautious with exercise recommendations. This may be due to doctors generally only knowing to recommend American College of Sports Medicine guidelines for a general population. (Philberg, 1994). Many recommendations do not have scientific foundation and are sometimes based on confusing clinical research or rely on the experience of the physician.

(Ytterberg et al., 1994; Bunning & Materson, 1991). Even the "pain after two hours" theory, where arthritis sufferers rate pain two hours after exercise to determine if they overused joints, is not a proven measure of effectiveness. (Bunning & Materson, 1991). Protocols, designs and procedures of previous research are so varied, that clinical significance is hard to determine. Many studies have too many uncontrolled variables, poor samples or built in biases. (Minor & Stanford, 1993; Ytterberg et al., 1994, Bunning & Materson, 1991). For example, in many cases, only subjects with controlled arthritis were used, and the emphasis was placed on the activity of the disease rather than functional measures. In addition, drug companies fund much of the research, so that drug related therapies are studied more often than are exercise related therapies. (Bunning & Materson, 1991).

Significance

When arthritis strikes, a person loses functional joint capacity, hindering mobility. Even though it is known that specific stretching techniques can enhance flexibility, these recommendations are based on active and usually disease free populations. While exercise is now thought to be beneficial for arthritis sufferers, there are still conflicting views on what should be recommended.

Walking, water aerobics and low impact exercise are the most commonly recommended programs; however, many receive no advice from the medical community. Those who wish to exercise are limited by availability and quality of the programs and facilities in their communities. The availability of qualified instructors is also a limiting factor in the quality of programming a community may offer. General aerobic and group leader certifications from organizations such as the American Council of Exercise,

American College of Sports Medicine and the Aerobic and Fitness Association of America do not ensure the instructor is qualified to teach arthritic clients. While all of these certifications require knowledge of how arthritis affects exercise, they do not specifically train or address how to instruct a program beyond general recommendations. Neither do these certifications require demonstration of modifications or pace or types of exercise for people with arthritis. Currently, the YMCA's P.A.C.E. program and Body Recall are the only programs recognized for their ability to aid senior adults with limited flexibility, range of motion, and arthritis.

The National Arthritis Foundation (NAF) has had exercise experts make recommendations and develop possible home programs, but there are no formal community based exercise programs developed. (NAF does endorse the YMCA's program). Since most people do not receive physical therapy, they turn to community based programs. These programs have the potential of aiding the arthritis victim, by improving of functional capacity and cardiovascular health, and by providing an inexpensive mode of socializing. All of these factors in combination can lead towards general health improvement. Unfortunately, many community exercise classes have not been analyzed as a treatment option. Because most recommendations for arthritis exercise have been based on clinically controlled research, there is little information on the potential functional benefit of existing programs. Information is needed to help physicians prescribe effective exercise therapy to arthritis patients. Therefore, it is important that studies be conducted with regard to community based programs.

Hypothesis

The research hypothesis states the following: Functional capacity, flexibility and conditioning will be significantly improved in the subjects of the water exercise group and Body Recall group. A sub-hypothesis states that the subjects of the water exercise group will be significantly improved over the Body Recall group in functional capacity, flexibility and conditioning.

The null hypothesis states that there will be no significant differences between the exercise groups and the controls in functional capacity, flexibility and conditioning.

Definition of Terms

Range of Motion - directional limits through which a joint moves.

Flexibility - the mobilization or freedom for movement to occur about a joint.

Absolute Flexibility - amount of flexibility a person has in relation to a predetermined set of standards.

Relative Flexibility - amount of flexibility a person has on a day to day basis.

Conditioning - exercise performed on a regular basis over a period of time.

Functional Capacity - the ability to perform necessary tasks of daily living

Optimal Exercise - the amount of exercise believed necessary to maintain functional capacity.

Body Recall - an exercise system developed by Dorothy Chrisman at Berea College. (Chrisman 1994)

Water Aerobics - exercise in water which strengthens cardiovascular endurance, muscular endurance, muscle strength, improves flexibility and body composition.

Delimitations

1. Subjects had to be between the ages of 18-75 years.
2. Subjects must be females.
3. Distance subjects had to travel to and from campus.
4. Whether or not the subject had reliable transportation.

Limitations

1. Classes were only able to be taught for 8 weeks instead of 10.
2. Variations in the Body Recall lesson plans were made according to equipment availability; however, this is acceptable and within the programs guidelines.
3. Pool temperature is warm, (84-92 degrees Fahrenheit, with an average of 88 degrees) but recommended exercise temperature could not be maintained due to the heating system of the pool.
4. Ankle injuries of two of the water aerobic exercisers.
5. Since subject numbers were so low, little significance was found. The low subject numbers are not surprising, since all the cited research protocols used small numbers.
6. The closure of the pool due to pump failure terminated the study.
7. The survey is a good way for individuals to self evaluate their limits; however interpretations may affect outcomes. Many of the subjects had questions regarding what was being asked or did not do the things asked. Many also stated arthritis.

8. Power outages interrupted one day.

Review Of Literature

Until the 1980's exercise was not recommended as treatment for arthritis. A study conducted by the Vanderbilt School of Medicine indicated that community based classes provide an excellent opportunity for arthritis patients to exercise, not only for the general benefits but for the relative cost. (Gordon, 1993). Noreau and associates found that only 2% of their subjects ever received therapy for their knees. Insurance may provide therapy coverage for a limited time, but few policies will compensate for continual exercise. (Noreau et al., 1995). Range of motion exercises incorporating passive, assisted and active stretching and strength exercises for improvement of joint muscular and shock absorbency are recommended. (Ytterberg et al, 1994). As a result of limited information about arthritis, joint stability and fear of disease activity are some of the reasons why exercise has not always been recommended for arthritis patients. Many believe that exercise may cause arthritis or that the joint movement may increase inflammation of the joint. Even when doctors recommend exercise, they tend to be very conservative with their exercise prescriptions. (Gordon, 1993). While the potential of harm from exercise exists, Ytterberg and associates believe that the harm is a result of the joint moving and not from the exercise itself. (Ytterberg et al, 1994). Exercise has been found to have positive effects on pain and other arthritis variables. (Minor & Sanford, 1993). Even after a six month follow up, Ekblom and associates still found exercisers had less occurrences of pain than controls. (Minor & Sanford, 1993). Several studies have documented that arthritis sufferers may participate in regular exercise without increasing pain or increasing joint inflammation. (Ytterberg et al., 1994; Minor &

Sanford, 1993). After reviewing several published studies, Minor and Sanford found no indication of joint deterioration in a walking or water fitness program while increasing aerobic capacity and flexibility. (Minor, 1994; Minor & Sanford, 1993; Galloway & Jokl, 1993). With consistent maintenance at certain angles, isometric exercise has been found to increase muscle strength in arthritis patients. (Bunning & Materson, 1991). Because of the original belief that movement will produce further pain and increase arthritis activity, isometric and isotonic exercises are mostly recommended, although no study has been done to prove isokinetic movement can cause harm (Ytterberg et al., 1993).

Arthritis is a medical condition that affects an estimated 40 million people, many of whom never receive an actual diagnosis. (National Arthritis Foundation, 1995; Ettinger & Afable, 1994; Gordon, 1993). Three times as many women are diagnosed with arthritis than men. (National Arthritis Foundation, 1995). According to the National Arthritis Foundation, osteoarthritis is the most common form of this disease, breaking down cartilage in joints. Heredity, obesity, injury and repeated overuse are believed to be the root causes of this particular form. (National Arthritis Foundation, 1995). It is estimated that by age 75, everyone will have at least one joint afflicted with osteoarthritis. (AFFA, 1993). Complications from osteoarthritis can include increased pain to the hip, knee and or toes, as well as restricted physical activity and inactivity. (Minor, 1994). Limitations in thumb and shoulder range of motion is also prevalent. Muscle atrophy and contracture can add to unevenness of gait and loss of strength. (Bunning & Materson, 1991). Treatment includes exercise, medication, heat and cold treatments, topical pain relievers, and the aid of walking devices. (National Arthritis Foundation, 1995).

Rheumatoid arthritis is another common form of arthritis, afflicting approximately 2.5 million Americans. While the cause is unknown, this possible immune disorder affects joints, tendons, ligaments and bones. This disease differs from person to person. Symmetrical joint inflammation and patterned inflammation are the unique identifiers of rheumatoid arthritis. (National Arthritis Foundation 1995). Treatments include drug therapy, rest, exercise, surgery, change in diet and possible relocation to warmer environments. Victims of rheumatoid arthritis are generally of poor physical condition (Ytterberg et al, 1994; Ekdahl & Broman, 1991) with many of the similar pain and mobility problems as osteoarthritis victims.

Conditions of arthritis limit functional abilities of its victims. While drug therapy is the most common treatment for arthritis, physical therapy and exercise are being prescribed more frequently. Exercise is known to increase range of motion, flexibility, muscle strength, muscle endurance, and cardiovascular fitness. It may also serve as an immunomodulator, acting to alter, either augmenting or reducing, the ability of the immune system. (Ytterberg et al., 1994; Bunning & Materson, 1991, Fisher & Pendergast, 1994). Several sources contend that inactivity leads to an increase in hypertension and cardiovascular death. (Galloway & Jokl, 1993; ACSM, 1995; Jordan, 1991; Sudy, 1991). Exercise can decrease obesity, prevent muscle atrophy and osteoporosis, and it can preserve function and independence. It can increase endurance, self-confidence, decrease depression and provide an outlet for social interaction. (Galloway & Jokl, 1993, Jordon, 1991; Sudy, 1991, Bishop, 1989). In general, exercise and recreational exercise provide an opportunity for participants to increase their quality of life.

Exercise may be performed in many modes from passive to dynamic. A well rounded exercise program will include a warm up, an aerobic component and a cool down. Flexibility and range of motion stretching and strength building exercises should be incorporated into the program. (Jordon, 1991; Sudy, 1991; Bishop, 1989). There are three types of stretching: passive, assisted and active. Passive or static stretching for fifteen minutes every two days for ten days has been found to improve flexibility. (Bunning & Materson, 1991). Unlike passive stretching, where the stretch is just held for a period of time, assisted stretching utilizes the help of specially trained professionals such as a physical therapist. Active, dynamic or active range of motion stretching, is movement of active muscle contraction through a tolerated range. (Bunning & Materson, 1991). Passive and active stretching are the forms of range of motion exercises most commonly found in recreational exercise classes.

In addition to range of motion and flexibility components, muscular strength development and maintenance should also be a consideration in exercise classes. In cases of inactivity and lack of use, strength will decrease up to 3-5% a week. (Galloway & Jokl, 1993;Bunning & Materson, 1991). When a person loses strength, more energy is needed to perform even simple daily tasks. Loss of the ability to function on a daily basis can result in the loss of independence and require institutionalization. (Galloway & Jokl, 1993). With relative ease and little need for equipment, isometric or passive exercises are commonly prescribed, especially in the case of poor joint or severe muscle weakness. (Bunning & Materson, 1991). Through the use of a resistive force, strength and range of motion increases have been observed in a five day per week exercise program in as little as four weeks. (Bunning & Materson, 1991). Isometric exercise involves static contractions whereas isokinetic movement controls speed. Strength development

movements may also be performed dynamically. The particular motion deemed appropriate is determined by the portion of the body being exercised and the condition of the person and the therapeutic goals.

Exercise is generally used for therapeutic or recreational purposes. Recreational exercise occurs in many forms from running, walking and aerobic classes to chair exercises and water aerobics. Recreational or community based exercise is readily available and at a relatively low cost. Land based programming provides many options such as walking, running, and exercise classes. Body Recall is an example of one of the possible exercise classes. Very little research has been conducted testing the effectiveness of Body Recall as a means of improving flexibility. (Pickering, 1991; Beagle ,1994). No research has been conducted examining the potential arthritic treatment benefits of Body Recall. Originally designed for senior citizens, Body Recall has been found to improve range of motion and flexibility using non-impact to low impact manner. (Pickering, 1991). Beagle (1994) found high compliance and socialization with Body Recall as well. Other land base regimens have found success in the improvement of functional capacity of arthritis sufferers. Cline (1989) found that after an 8 week passive and active stretching using Arthritis Foundation recommended exercises improved range of motion in the knee in her group of 39 elderly women. After participating in a supervised walking study for eight weeks, 102 subjects with osteoarthritis of the knee had a 37% improvement in activity, a 10% increase in efficiency and a 26% decrease in pain. (Kovar, 1992).

Another example of recreational exercise is water aerobics. Bunning and Materson (1991) found water exercise to be "very efficacious," with high compliance due to the recreational and socialization nature of the program. The buoyancy of the

water allows for pain free movement by decreasing the effects of gravity. (Semble, 1995). Rotary torques are generated in a buoyancy assisted environment. (Galloway & Jokl, 1993; Bunning & Materson, 1991). As speed of motion increases, then the isokinetic, or resistance of the water increases. (Bunning & Materson, 1991). Several studies have examined the effectiveness of water aerobics in the treatment of people with arthritis. Comparing 87 water exercise participants to 174 clinical patients, Meyer and Hawley (1994) found that along with a decrease in pain, both osteoarthritic and rheumatoid arthritic subjects had improvements with grip strength, and less morning stiffness and joint swelling. Marian Minor found a significant improvement in physical fitness and functional capacity. (Bunning & Materson, 1991). In a pilot study using 47 patients with osteoarthritis of the hip, Green and colleagues confirmed that only six weeks hydrotherapy, used concurrently with a home exercise program, is an effective treatment for osteoarthritis, although no significant improvement was measured when compared to the subjects in the home exercise only group. (Green, et al 1993).

The therapeutic effects may be unclear, but exercise is now considered safe. (Ytterberg et al., 1994). After an eight year study, Dr. Robert W. Ike at the University of Michigan concluded "poor endurance and fitness is just as much a result of inactivity than arthritis." Exercise can be performed without hurting joints, and functional capacity can be improved by participating in aerobic fitness. (Gordon, 1993).

Exercise advice for osteoarthritis patients vary from physician to physician and depends on what type of reduced joint motion or function the person has. (Ytterberg et al, 1994). The knee is one of the most commonly affected joints. A positive correlation between lack of knee motion and obesity has been noticed in research. (Messier, 1994). Decreased isokinetic muscle strength has also been found in lower body arthritis.

(Ytterberg et al., 1994). Short term research protocols have found positive benefits with exercise. Minor & Sanford utilized an eight week training program with isokinetic strengthening. (Minor & Sanford, 1993). Physiological parameters in a supervised walking program produced an increased distance in a 12 minute walk test as well as decreased incidents of pain. Resistance training improved strength, decreased knee pain and improved physical function. The controls actually had a slower performance in the post-test than on the pre-test. (Ettinger & Afable, 1994). However, many studies look only for individual improvements and not functional improvements. More long term studies are needed for this type of evaluation. (Galloway & Jokl, 1993; Stenstron, 1994).

Osteoarthritis patients are not the only ones to have been found to receive benefits from exercise. Sufferers of rheumatoid arthritis patients have also benefited. Treatment options initially included only rest and medications. Now, exercise is also being considered a treatment option for rheumatoid arthritis. To date, most studies using rheumatoid subjects have focused on changes in strength and aerobic conditioning and not range of motion. This is probably the result of this group being traditionally in the poorest physical fitness, with VO2max 30% lower than non-arthritic counterparts. Minor also found rheumatoid arthritis subjects to be more unfit than osteoarthritis subjects. Dynamic exercise has been found to increase strength and aerobic capacity more so than isometric exercise, while not increasing the frequency of arthritic flare ups or increasing inflammation of the arthritic joints. (Noreau et al, 1995; Semble, 1995; Stenstrom, 1994; Ytterberg, et al., 1994). Therapeutic dynamic exercise has been found to improve functional capacity. In a review examining several studies utilizing different modes of exercise, Stenstrom found that exercise decreased pain and improved efficiency. Even a four year, once a week water exercise program resulted in an increase in grip strength

while decreasing hospital admission. (Stenstrom, 1993). It was reported by Perlman et al., rheumatoid arthritis subjects in a dance based exercise program experienced less pain, less joint swelling and depression. (Noreau et al., 1995). Other studies have also found decreased swelling with no adverse effects as a result of the exercise. (Noreau et al., 1995). Another review of published studies found that subjects on a walking regimen had a general decrease in pain while water exercisers had fewer episodes of morning stiffness. (Minor & Sanford, 1993).

Summary

An estimated 40 million people have some form of arthritis. Osteoarthritis and rheumatoid arthritis are the most common forms of arthritis. Many treatment options are available, and exercise is slowing becoming recognized as an option. Some research has been conducted, evaluating the effectiveness of exercise as a treatment for arthritis. Most of this research has been in a clinical setting, with differing exercise protocols. The effectiveness of community based programming as a treatment options has not often been studied. Dance based exercise, water exercise, stretches recommended by the National Arthritis Foundation, and weight bearing exercise are all forms of exercise which have been examined as effective treatments. Body Recall has only been used in a few protocols, with only one study examining the effects of exercise towards improving flexibility. It has never been used in an arthritis study.

Methodology

The problem was to determine and compare the effectiveness of two community based exercise programs in the treatment of arthritis, land based and water based. Issues that needed to be addressed were:

1. Selection of study participants.
2. Selection and administration of instrumentation.
3. Selection of exercise classes.
4. Selection of exercise leader.
5. Administration of the pre and post tests.
6. Administration of the treatment exercise classes.
7. Data organization, analysis and discussion with conclusion and recommendations.

Population and Sampling

All subjects were volunteers, who responded to written advertisements and radio announcements in Rowan, Menefee, Bath, Carter and Morgan Counties in Kentucky. As volunteers, these subjects participated willingly, looked for personal improvement and were more likely not to let their pain hinder their involvement. Volunteers participated in the exercise programs because they wanted to either exercise or look for possible improvement in their condition. All subjects had doctors who encouraged them to exercise. Volunteers were limited by age (18-75 years), lived in one of the above mentioned counties, and had no contagious ailment. Subjects had been diagnosed with a

form of arthritis and were able to exercise three times a week for eight weeks. Subjects were allowed to have other health related conditions such as heart disease and diabetes. Randomization of exercise participants occurred once pre-testing was complete. Control subjects were also volunteers, but did not have the time to commit to exercising. Pre-test is concurrent with the exercise subjects and into the beginning of the first week. Since this project is aimed to measure the effectiveness of community classes, subjects were not disqualified due to absences, but they were told their data would not be usable if they missed more than five classes.

Five subjects were controls. Five subjects participated in land based Body Recall type exercises and six participated in water aerobics. Exercise classes met three days a week, for eight weeks. Since these classes were taught exactly as community classes, subjects were allowed to miss as many days as they needed, but for the sake of making conclusions, data were discarded for subjects who missed more than six classes.

Pre- and Post Testing

The data were collected in the following order:

1. Completion of waiver, health history questionnaire, physical referral form and Stanford Pain Assessment Scale.
2. Measurement of resting heart rate and blood pressure.
3. Determination right and left hand grip strength.
4. Determination of Body Composition, Height and Weight.
5 Administration of Cooper 12 Minute Run - Walk test.
6. Administration of flexibility tests.

The pre- and the post test were each approximately one hour. Most of the testing was done in a group format. Subjects did not measure nor record data, with the exception of the walk test. Subjects who were not able to attend one of the two scheduled testing times were tested individually.

Paper work

Subjects were asked to complete a waiver, a health history questionnaire, to obtain a physician's release (exercisers only) and the Stanford Pain Assessment Scale. (See Appendix F). If subjects had a questions on the Stanford Pain Assessment Scale, they were asked to answer the question according to what they thought it meant. This was done so that in the post test, the subjects would interpret the question in the same manner.

Physical Testing

Physical testing instruments and protocols are selected according to the following criteria:

1. Reliability and validity of tests.
2. Ease and accuracy of interpretation and scoring.
3. Availability of norms appropriate to the sample.
4. Ease of administration both in time and cost.
5. Availability of testing equipment.
6. Ability of the subjects to perform tests without discomfort.
7. Administration by a limited number of individuals.

Pulse - The pulse was measured through palpation of the wrist for a 15 second count. Subjects were seated for at least 15 minutes to replicate a resting state. The fifteen second count was chosen for ease, quickness, and familiarity. Many of the subjects as well as the researcher and assistant utilized this protocol at the Morehead Clinic Cardiac Rehabilitation Unit.

Blood pressure - Blood pressure was taken using an anaeroid sphygmomanometer, with the cuff placed on the left arm. The left arm was held at heart level and subjects were asked to open their hand and let the arm relax. Subjects were seated for at least 15 minutes, to replicate a resting state.

Grip strength - Right and left grip strength was measured using a Smedley 100 kg hand grip dynamometer. Subjects were told to raise the hand with the dynamometer above their head (sagital plane) and then squeeze the handle as hard as possible while lowering the arm, to their side. A demonstration was given. The best score out of three trials was recorded. Subjects' reliability coefficients have been reported of $r = 0.90$. (Johnson & Nelson, 1986).

Height - Height was measured in inches to the nearest quarter inch. Shoeless subjects stood with their back against the wall, hands-on hips, inhaling and chin

90 degrees to the body. Height was measured from the top of the head to the floor in inches.

Weight - Weight was measured on a calibrated Befour Inc. Digital Scale in pounds, to the nearest tenth pound.

Bio-electrical impedance - The electrolipograph by Bioanalogic ELG was used according to company instructions for electrode placement. (Bioanalogics, 1995) While many body composition options were available, this was selected for ease of administration and relative little discomfort to the subject.

Cooper 12 Minute Run-Walk Test - Subjects counted the number of laps they could walk in twelve minutes. This test is performed using the indoor track of the Academic Athletic Center at Morehead State University. (8 laps = 1 mile). Subjects were told to walk as far as possible in the 12 minutes at a steady pace. Subjects were allowed to stop and rest if needed. Reported reliability is 0.94. (Johnson & Nelson, 1989).

Survey - The Stanford Functional Capacity Scorecard was used. Dr. James Fries developed this questionnaire to be used as a self-evaluation method for people with arthritis. Kenneth Cooper, a nationally recognized fitness authority, recommends this survey and uses it as part of his programming at the Cooper Clinic and Research Institute in Dallas, Texas. (Gordon, 1993).

The flexibility tests were selected according to the above mentioned criteria with an emphasis on the availability of equipment, reliability, ease of testing, comfort of subjects and specifics of what was being measured. The specific joints measured were those joints that affect ambulation. In all cases, the best score of three trials was recorded. This was the result of all tests being based on the best score of three trials.

AAHPERD Sit and Reach Test - This test was used to measure flexibility of the low back and posterior thighs. The Sport Trim Sit & Reach Box was used. Subjects sat on the floor with legs in front, bending from the waist while extending the arms straight ahead. Middle fingers of both hands, one hand on top of the other, legs were extended straight to the box, and the knees were straight. Subjects moved their fingers slowly forward as far as possible or until their knees began to bend. Pre-bend hand position and post-bend hand position were measured. Reliability ranges from 0.84 - 0.98. Validity is accepted at face value. (Johnson & Nelson, 1989; Orloff, 1988; Bood, 1990).

Shoulder- Wrist Elevation Test - This test was used to evaluate shoulder and wrist flexibility. A yard stick and ruler were the equipment needed. Subjects laid face down on a mat with arms stretched in front of the head. Subjects held a ruler in their hands and lifted it up as high as possible, while keeping arms straight, the chin face still down on the mat. Subjects were to hold their legs straight with no arch in their back. Distance between the ruler and the mat was

measured with the yard stick. The ruler was held flat and perpendicular to the yardstick. Reliability is reported to be 0.93, objectivity is 0.99 and validity is accepted at face value. (Johnson & Nelson, 1989; Orloff, 1988).

Trunk and Neck Extension Test - This test measured the ability to extend the neck and trunk. A ruler and yard stick were used. Subjects were positioned face-down with arms at the side, with palms up (supination). Keeping the neck in alignment with the spine, the subjects raised their torso. Distance between the nose and the mat was measured with the yard stick. The ruler was held at a level perpendicular to the yardstick as a guide. Reliability is reported at 0.90. Objectivity is reported at .99. Validity is accepted at face value. Three trials were performed with the best value recorded. (Johnson & Nelson, 1989; Orloff, 1988).

Shoulder Rotation Test - The object of this test was to measure rotation of the shoulder using as narrow of a grip as possible on the measuring tape. In inches, the shoulder span of subjects was determined and then subtracted from the length of measuring tape needed to rotate straight arms from front to behind the body. In a standing position, the measuring tape was gripped with both hands in front of the body. The arms were then rotated overhead and then behind the body. During the rotation, while gripping the tape lightly and maintaining as narrow a grip possible, the right hand was slid down the tape to allow the slack necessary for the arms to complete the rotation. Reliability is reported at 0.99. Objectivity is reported at 0.99 and validity is accepted at face value. (Johnson & Nelson,

1989; Orloff, 1988).

Ankle Extension (Plantar Flexion) Test - This test measured plantar flexion of the ankle. A yard stick and ruler were used. Each foot was measured individually. Sitting on a mat with legs straight out in front of the body, one foot was flexed with toes toward ceiling. The distance between the distal (further point) end of the calf and the mat was measured. Then the ankle was extended to measure the distance of the plantar flexed toes to the floor. The lower shin bone line measurement was subtracted from the upper foot line. A reliability of .88 is (Johnson & Nelson, 1989).

Ankle Flexion (Dorsiflexion) Test - This test measured the ankle flexion and stretch the gastrocnemius. As directed by the instructions, a yard stick and ruler were used. With chest and chin remaining in contact at all times with the wall, subjects were instructed to scoot feet away from wall as far as possible without moving the chin or chest. The hands were allowed to extend against the wall, but the body and knees were to be kept straight. The distance between the wall and the toes were then measured. Reliability is 0.88 . Objectivity is .99 and validity is accepted at face value. (Johnson & Nelson, 1989).

Land Based Exercises

The land based exercises were taught according to Body Recall protocol. (Chrisman, 1994). Variations in the Body Recall lesson plans were made according to equipment availability; however, this is acceptable and within the program's guidelines.

All contraindicated exercises were modified according to ACSM, AFFA, and ACE guidelines. Appendix A gives the exercise plans, exercise description and modifications may be found in Appendices B and C.

Water Aerobics

Water aerobic classes took place in the McClure Pool at Morehead State University. Routines were a combination of exercises found in the HydroRobics, United States Water Fitness Association and Fantastic Water Workouts. The class consisted of 10 minutes of warm up and stretching, 30 minutes of aerobic activity, six minutes of upper body strengthening, 10 minutes of leg flexibility and general stretching. Since a few subjects had never been in a pool, the first day consisted of water introduction. The aerobic segments lasted 20 minutes, 25 minutes, and 30 minutes for weeks 1, 2 and 3, respectively. Seven toning movements, focusing on the upper body, were introduced the second week and continued throughout the remainder of the classes. Swim floats were utilized as resistance objects. Exercises recommended by the National Arthritis Foundation were integrated into the aerobic segment. The pool temperature was 84-92 degrees Fahrenheit (with an average of 88). Appendix D shows the class exercise log, and specific water aerobic exercises may be found in Appendix E.

Data Analysis

It was assumed that the measurements for each "intact" group could be individually treated, tested and analyzed through inferential statistics. No significant difference was the null hypothesis used in every situation. Using the statistical computer program, Statistics with Finesse, Analysis of Covariance (ANCOVA) was performed.

This test was selected to account for initial and uncontrollable differences in the group. ANCOVA can also be used with groups having fewer than ten subjects. Multiple comparisons to detect significant difference between individual groups were performed with the Brancroft test. A paired two-sample t-test was used to determine significance between pre and post scores in the two exercise groups. An alpha level of 0.05 was selected for all tests.

Results

A total of 16 women were the subjects for this study. The mean age was 51.00 (50.56) years. Women who could commit to the exercise were randomly placed into two groups. The Body Recall group (N = 5) had a mean age of 45 years. The water aerobics group (N=6) had a mean age of 59.5 years. The remaining five became the control group. The controls (N=5) had a mean age of 53 years. No subjects were disqualified as a result of absences because if these classes were taught as community classes, there would be no attendance policies. Exercisers attended when possible. One water aerobic subject had to drop out of the study due to an allergy aggravated by the chlorine. Only one subject missed more than three classes. One control was unable to attend the post test measurements due to travel conflicts.

Multi Group Comparison

A post exercise significant difference ($p \geq 0.0251$) in shoulder rotation was found comparing exercise groups and the control group. (see Table 1). After Bancroft Analysis a means difference of 4.739 was significant at the 0.05 level in the controls and a means difference of 13.773 and 9.033 respectively, were significant at the 0.01 level for the water aerobics and Body Recall groups. No significant differences were found between the exercise groups and the control group in sit & reach ($p \geq 0.3967$), shoulder - wrist elevation ($p \geq 0.0937$); ankle dorsiflexion ($p \geq 0.8321$); right ankle plantar flexion ($p \geq 0.7940$); left ankle plantar flexion ($p \geq 0.794$) and trunk and neck extension ($p \geq 0.7466$), resting heart rate ($p \geq 0.6223$), resting diastolic blood pressure ($p \geq 0.4063$),

height ($p \geq 0.8488$) weight ($p \geq 0.2606$), grip strength (rt. hand $p \geq 0.3889$; lt. hand $p \geq$ 0..2162), body fat ($p \geq 0.3073$): Cooper 12 Minute Run - Walk test ($p \geq 0.3540$), and survey ($p \geq 0.6143$).

Area Measured	Between Group	Within Group	F-Ratio	Probability
Resting Heart Rate	182.96	1838.31	0.4976	0.6223
Diastolic BP	86.00	435.72	0.9869	0.4063
Weight	42.596	138.053	1.5427	0.2606
Height	0.260	7.800	0.1667	0.8488
Rt. Hand Grip	196.35	944.47	1.0395	0.3889
Lf. Hand Grip	275.83	769.61	1.7920	0.2162
Cooper 12 min	16.5684	24.3732	3.3989	0.0748
% Body Fat	16.321	47.574	1.3723	0.3073
Total Answers	6.31	61.62	0.5119	0.6143
Sit & Reach	38.19	188.04	1.0155	0.3967
Trunk & Neck Ext.	5.4209	71.5858	0.3786	0.6942
Shoulder Rotation	423.334	388.377	5.4500	0.0251*
Shoulder & Wrist	56.2412	92.8632	3.0282	0.0937
Ankle Dorsiflexion	4.217	85.238	0.2474	0.7855
Rt. Toe Plant. Flex	0.8545	23. 7632	0.1798	0.8381
Lt. Toe Plant. Flex	1.111	18.4622	0.3009	0.7466

*Significant at the 0.05 level.

Brancroft test found $p > 0.0251$ significant with Control, Water Aerobics and Body Recall.
Control: Difference of Means 4.739 is significant at $p \geq 0.05$.
Water Aerobics: Difference of Means 13.773 is significant at $p \geq 0.001$.
Body ReCall: Difference of Means 9.033 is significant at $p \geq 0.001$.

Analysis of Covariance of Pre- and Post Tests Between Control, Water Exercise and Body Recall Groups.

Table 1

Individual Group Comparison

In the Body Recall group (see Table 2), significant absolute flexibility improvements ($p \leq 0.5$) were found in all areas. In the sit & reach test, subjects initially

scored a mean of 26 inches and improved to 28.4 at the time of the post test. This yielded at t value of 0.276 at 4 degrees of freedom, significant at the 0.05 level. In the area of shoulder rotation, the initial mean of the pretest was 24.9 inches. This improved to 38 inches at the time of the post test. At four degrees freedom, a t value of 0.009 was found to be significant at the 0.05 level. The ankle dorsiflexion test produced an initial mean of 18.1 inches. Post test values found an improvement to 27.5 inches. At four degrees of freedom, a t value of 0.313 was found to be significant at the 0.05 level. Left toe plantar flexion had an initial mean of -3.6 inches. This improved to a post test mean of -1.4 inches. At four degrees of freedom, a t value of 0.008 was found to be significant at the 0.05 level. An improvement was also measured with the right toe. A pretest mean of -3.75 inches improved to a post test mean of -0.8 inches. At four degrees of freedom, a t value of 0.003 was found to be significant at the 0.05 level. Grip strength in the right hand improved from a pretest mean of 19 kg to a post test mean of 32.4 kg. At four degrees of freedom, a t value of 00.050 was found to be significant at the 0.05 level. Left grip strength also improved from a pretest mean of 19.6 kg to a post test mean of 40.8 kg. A t value of 0.096, with four degrees of freedom, was found to be significant at the 0.05 level. Trunk and neck extension improved from a pretest mean of 9.75 inches to a post test mean of 11.08 inches. At four degrees of freedom, a t value of 0.001 was found to be significant at the 0.05 level. Shoulder and wrist elevation also improved. The pre test mean was measured at 6.7 inches. The post test mean was measured at 13.7. At four degrees of freedom, a t value of 0.013 was found to be significant. An improvement of a mean of 5.65 laps to 5.7 laps was measured with the Cooper 12 Minute Run - Walk test. At four degrees of freedom, a t value of 0.5 was found to be significant at the 0.05 level. At the 0.05 levels, improvements were measured in the

overall total answers ($p \leq 0.04$).

A significant increase was found with the percent body fat. The post test measured a mean of 29.7 percent, up from 28.5 percent. With four degrees of freedom, a t value of 0.196 was significant at the 0.05 level.

	Pre Test				Post Test				t-Test	
	Low	High	Mean	SD	Low	High	Mean	SD	t stat	Measured
Sit and Reach	13	52	26	15.30	18	40	28.4	8.44	-0.649	0.276
Shoulder	17.5	37.5	24.9	8.41	29.5	41.5	38	4.87	-3.753	0.009**
Ankle	11	25.5	18.1	5.55	16	27.5	18.9	4.86	-0.526	0.313
Left Toe	-4.5	-2.5	-3.6	0.84	-3	0	-1.4	1.39	-3.959	0.008**
Right Toe	-4.25	-2.25	-3.75	0.87	-2.5	0.5	-0.8	1.35	-5.256	0.003**
Right Grip	9	26	19	7.11	13	48	32.4	13.74	-2.13	0.050*
Left Grip	7	25	19.6	7.80	20	46	40.8	10.78	-1.563	0.096
Trunk	3	13	9.75	4.10	10	19	14.8	3.33	-7.124	0.001**
Shoulder & Wrist	2.5	16.5	6.7	5.80	8.5	17.5	13.7	3.36	-3.446	0.013*
% Fat	19.9	34.5	28.5	5.58	20.9	38.1	29.7	6.83	-0.957	0.196
!2 min Walk	4.5	7.5	5.65	1.14	5	6	5.65	0.42	0	0.5

* significant at $p \geq 0.05$ ** significant at $p \geq 0.01$

A Paired Two Sample for Mean t-Test for Body Recall

Table 2

In the Water Aerobics group, (see Table 3), in comparison to pre- and post exercise, significant absolute flexibility improvements were found in sit & reach, left toe plantar flexion, left and right grip strength, trunk and neck extension and shoulder and

wrist elevation . In the sit & reach test, subjects initially scored a mean of 27.4 inches and improved to 31.6 at the time of the post test. This yielded at t value of 0.102 at five degrees of freedom, significant at the 0.05 level. Left toe plantar flexion had an initial mean of -0.55 inches. This improved to a post test mean of 1.11 inches. At five degrees of freedom, a t value of 0.269 was found to be significant at the 0.05 level. Grip strength in the right hand improved from a pretest mean of 26.8 kg to a post test mean of 29 kg. At five degrees of freedom, a t value of 0.283 was found to be significant at the 0.05 level. Trunk and neck extension improved from a pretest mean of 7.15 inches to a post test mean of 12.5 inches. At five degrees of freedom, a t value of 0.009 was found to be significant at the 0.05 level. Shoulder and wrist elevation also improved. The pre test mean was measured at 5.1 inches. The post test mean was measured at 8.3 inches. At five degrees of freedom, a t value of 0.0443 was found to be significant.

A significant loss of right toe plantar flexion was measured. The post test measured a mean of -1.8 inches, which was down from the pre test mean of 0.25 inches. With five degrees of freedom, a t value of 0.165 was significant at the 0.05 level. A significant improvement in pre and post test left hand grip strength was found. A pretest mean of 27.8 kg was significantly better than the post test mean of 25.8 kg. At five degrees of freedom, a t value of 0.247 was found to be significant at the 0.05 level. A significant decrease of performance was found with the Cooper 12 Minute Run - Walk test. A pretest mean of 4.4 laps was better than the post test mean of 2.6 laps. At five degrees of freedom, a t value of 0.078 was found to be significant at the 0.05 level.

No improvements or significant decreases were measured in shoulder rotation or ankle plantar flexion. Shoulder rotation had an initial mean of 33 inches and a final mean of 33.6 inches. A t value of 0.426 at five degrees of freedom was not significant

at the 0.05 level. Ankle plantar flexion had a pretest mean of 18.4 inches and a post test mean of 18.1 inches. A t value of 0.432 was not found significant at the 0.05 level with five degrees of freedom.

	Pre Test				Post Test				t-Test	
	Low	High	Mean	SD	Low	High	Mean	SD	t stat	Measured
Sit and Reach	17	32	27.4	6.27	29	36	31.6	2.61	-1.519	0.102
Shoulder	29	37.5	33	4.50	17	4.5	33.6	9.73	-0.198	0.426
Ankle	13	28	18.4	5.94	12.5	23.5	18.1	4.20	0.182	0.432
Left Toe	-4.75	1	-0.55	3.75	-2.5	-0.25	-1.85	1.05	0.669	0.269
Right Toe	-3	4.75	0.25	3.14	-4	0.5	-1.8	1.75	1.105	0.165
Right Grip	13	38	26.8	10.42	13	36	29	9.43	-0.624	0.283
Left Grip	12	36	27.8	11.14	10	38	25.8	11.19	0.750	0.247
Trunk	2	13	7.15	4.15	4.5	22	12.5	6.70	-3.858	0.009**
Shoulder & Wrist	3	6.5	5.1	1.56	1.5	11	8.3	4.07	-2.254	0.044**
% Fat	31.7	42.8	38.0	5.69	29.0	41.2	36.5	4.84	0.200	0.437
!2 min Walk	3	5.5	4.4	0.96	0	5	2.6	2.07	1.744	0.078

* significant at $p \geq 0.05$ ** significant and $p \geq 0.001$

A Paired Two Sample for Mean t-Test for Water Aerobics

Table 3

Discussion

The exercise groups had significant improvements ($p \geq 0.01$) in shoulder rotation when compared to the control. Ambient testing conditions, flair ups, joint conditions and sleeping positions may account for the significant ($0 \geq 0.05$) improvement in shoulder rotation in the control group. Neither exercise modality was shown to be more effective than the other. Post test walking improvements were significant in Body Recall, but not water exercise. This was more than likely due to the two water exercisers who injured their ankles during the eight weeks and could not post test rather than cardiovascular improvements. Body Recall exercisers did have more individual pre- and post test improvements, although not significant. Specificity of exercise and arthritic flair ups could account for this difference. In both groups, significant decreases could possibly be accounted for by arthritic flair ups or the test conditions. Even thought testing conditions were controlled for as much as possible, improper hydration or eating within four hours of the test produced false measurements with the bio-electrical impedance. Subjects would often forget about eating restrictions and water needs on test dates. Future research needs to be conducted, evaluating functional improvement rather than absolute improvement.

Conclusion

1. In this study, the null hypothesis was accepted in every case except one: shoulder rotation. Eight weeks of exercise did not provide a significant measurable pre and post improvements when the exercise groups were compared to the control

group. Eight weeks of exercise did provide some pre- and post improvements in the individual exercise groups.

2. All exercisers reported a perceived increase in functional capacity, through an increase in pain free movement.

3. Both forms of exercise showed significant improvements within their groups.

Recommendations

1. More long term studies are needed to better evaluate perceived functional improvements. The subjects perceived they were better. While many significant differences were not found, one important finding needs to be reported. Upon verbal communication, all exercisers believed they had regained better movement in body joints. Many noticed the improvements in only two weeks. This has a two fold meaning: 1) many of their limitations are psychological and this provided a way to overcome them or 2) the amount of joint rotation needed for measuring significant improvements in flexibility is much more than an arthritis sufferers needs in order to notice improvements.

2. Norms and better measuring devices may need to be developed to better address the needs of people with arthritis. It is possible that the relative flexibility gains may improve functional capacity before any significant flexibility improvements, as measured with absolute national norms. Exercise subjects verbally explained that they could perform tasks better, walk better, use their shoulders better, have less pain at night, and generally feel better. However, with the exception of shoulder rotation, data did not support these claims since no significant differences were found when compared to the controls. Even with some

significant improvements among the individual groups, many areas of perceived improvement were not significant. Water aerobics subjects only had two significant improved areas (but not significant when compared to the Body Recall subjects or the controls), but the subjects claimed improvements in the areas not found significant.

3. The development of instruments dealing with pain and pain assessment to appropriately measure these areas would be useful in future research. Pain is not an appropriate guideline for not participating in exercise. Pain ratings also appeared to be inappropriate. While pain was not specifically measured, subjects were questioned as to whether or not they had pain hours after class or before class. If subjects answered they had pain before class, they were reminded that it is recommended they not exercise. All subjects stated that the exercise made their pain go away. Many also stated that they are constantly in pain and that exercise decreased it. Subjects also stated that they thought the exercise helped them sleep more comfortably at night. They did not have pain and could rest. These conversations are similar to what Ralizadeh found in her research. (Ralizadeh, 1994).

4. A better self-assessment instrument needs to be developed. Many subjects did not perform some of the activities on the survey or interpreted the questions to mean different things. Many subjects stated that this survey did not address their arthritis limitations.

5. Long-term research is needed. The findings of this study pose many questions to be answered in future research. The lack of significance may have been a result of the time of the class. Since, Body Recall was a very slow paced movement

program, and many of the water exercisers were slow, more time may be needed to evaluate successfulness. Sixteen weeks of exercise might have garnered better outcomes.

6. Another area that could also be investigated would be the effect of the exercise on arthritis over time, specifically addressing how long after the class do subjects still see improvements in their functional flexibility or how long until they have reverted to their prior limitations.

7. Community classes need to be studied more. Despite the results, community classes remain a valuable treatment tool. While the results were not conclusive, the community classes were effective, since the subjects believed they improved. Based on verbal communication, it seems it is slight improvements that make a difference in the ability to do things. Community classes are inexpensive and are usually offered year round. If some statistical power were sacrificed and classes already in existence were used, more subjects might be available. The inexpensiveness of the classes makes it possible for those on a fixed income to participate. Another advantage to these types of classes is the ability to exercise when injured. Two of the water aerobic subjects suffered from ligament damage in their feet and ankles. While it made walking on land difficult, not one subject was hindered in the water. Even the Body Recall subjects with foot problems could continue since the sequences were non-jarring and usually performed in a chair or standing in place.

8. Properly trained instructors are needed to insure adequate exercise selection and exercise safety. Because arthritis is such a hindering disease, an instructor needs to know how to safely modify motions. This is the case in both Body Recall and

Water Aerobics. In many areas, community classes are not taught by properly trained instructors. A certification does not always ensure proper training.

9. Qualifications of instructors teaching community programs is an issue needing to be addressed. While many of the exercise concerns are the same, many instructors bring their land routine to the water, failing to account for the buoyancy and the resistance provided by the water. While participants may have fun, they will not be receiving the range of motion or cardiovascular benefits a water exercise program can produce if an instructor is not properly trained in water exercise. The qualifications of Body Recall instructors also needs to be addressed. While "certified" instructors attended a week long certification process, many aspects of the exercises have not been modified to what are nationally recognized and legally recognized standards. In addition, many of the instructors do not have training in exercise modification and safety, and may not be able to provide adequate or safe alternative to participants. The instructors also need to know how to safely alter the program to keep the interest of their subjects and still provide functional benefits. In the case of Body Recall, many of the subjects found the brisk walking to music boring and preferred to briskly walk around the indoor track.

Problems faced in this study are also problems that affect community programs, which can affect individual results. Class scheduling, location, weather and equipment problems are just some of the concerns that may deter participants from exercising. Even so, socialization and self - perception are key components which aid in the success of community classes. A simple class offered through the YMCA or other

community organization can help people overcome the assumption that as a result of arthritis they have to be limited in what they do. The slight improvements that participants may notice seem to be enough to decrease pain, increase functional capacity and make the condition of arthritis a little more bearable.

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APPENDIX A

LESSON PLAN FOR BODY RECALL

WEEK 1

4/15/96

Lead exercise LESSON 1, pages 147 - 148 in text.

Review the exercises by having the class "Follow the Leader"

(instructor is leader)

Began learning "Sitting Dream"

Began soft ball exercises

Neck exercises

Assigned reading in textbook:

Preface, Introduction, Mythology of Aging

4/17/96

Exercises for LESSON 1

Continued "Sitting Dream"

"Follow the Leader"

Discuss exercise - How does it look? What does it do? Who

Why do people exercise?

Talk about assigned reading assignment

End session resting in chair

Assigned reading in texts: Mythology of Exercise

4/18/96 LESSON 1

"Follow the Leader" - added music

"Sitting Dream" - added music

Discuss exercise concepts in the reading

Define Body Recall

Lead Exercise Lesson 3, pages 152 - 154

Practice correct standing and walking techniques

Discussed why Exercise is important

Assigned reading: Tension Release; Relaxation

WEEK 2

4/22/96	Brisk walking with music, checking posture
	"Follow the Leader" - with music
	Soft ball activity from teaching manual
	Soft ball sequence - with music
	Chair resting with music
	Assigned reading : Ball sequence
4/24/96	Brisk walking to music
	"Follow the Leader" - with music
	"Sitting Dream" - with music
	Stair climbing and descending
	Assigned reading: Body Mechanics
4/26/96	no one showed for class

WEEK 3

4/29/96

Walked one lap around the AAC

Sit up sticks

Learned alternate safe abdominal crunches

"Follow the Leader"

"Sitting Dream"

LESSON 1

LESSON 2

Practiced stair climbing and descending

Assigned reading: Foot Care, Back Pain

5/1/96

Sit up sticks available (From here on out, the sticks were available before every class, but no one ever used, even with reminders that they were there)

Posture check and pelvic tilt against the wall

Discuss back ache

Talk about proper weight transfer while walking

Exercises session (87, 91, 134, 135 136 138 181, 199)

Sitting position E exercises (40, 71, 82)

Begin exercise from the aerobic sequence

Marble activity

Foot massage

Assigned reading : Variations of Walking, Pelvis Tilt and Exercise 205

5/3/96 Sit up stick available

5/3/96 Locomotion with knee lifts and two - step pattern

Exercise session (include abdominal breathing, exercise 205)

Jump rope activity

"Soft ball" with music

"Follow the leader" with music

Exercises suggested for fall preparation

Assigned reading : Relaxation, Abdominal Breathing

WEEK 4

5/6/96

Sit up stick available

Walk 2 laps in the AAC

1-3 of jump rope activity

Foam ball kicking at random

Pass balls with hand and feet

Elastic rope sequence- begin learning

First four exercises of "Sitting Wand"

Falling and getting up activity

LESSON 1

End work on the floor with a recovery style(getting up)

Neck circling, relaxation in chair

Assigned reading: Floor sitting and Floor lying positions

Falls and recoveries from the floor

5/8/96

Sit up sticks available

Walk 2 laps in the AAC

Exercise Session - Day 3

Elastic rope sequence - add music

Practice previous learned "Sitting Wand" steps

Learn 1 - 6 for Dream

Floor exercise, ending with relaxation on the floor

5/10/96

Sit up sticks available

Walk 2 laps in the AAC, using knee-lifts and two step pattern

Review concepts of aging

Exercise lesson on page 164 - 165 (week 4, lesson 3)

"Sitting wand" add step 5 - 8 and then all with music

Elastic rope sequence with music

Assigned reading: Incentives

WEEK 5

5/13/96	no electricity, no sit up sticks, no music
	Walked 2 laps in the AAC
	Warm up and Soft Ball sequence
	Standing exercises, including aerobic exercises
	Sitting exercises, including # 78, and # 72
	Elastic rope sequence
	Neck circling
	Chair relaxation
5/15/96	Sitting Wand, add 9 -10; repeat 1 - 10 with music
	Week 4, Lesson 3
	Sitting Dream sequence, steps 6 - 12 omitting 10
	Begin Standing Wand
	Begin Standing Dream 1-7
	Sitting Exercises
	Elastic rope sequence with music
	assigned questionnaire with answers to be turned in

5/17/96	Sit up sticks available
	Foam ball kicking at random
	Briskly walking 2 laps of AAC
	"Follow the Leader"
	Elastic rope sequence
	Entire sitting wand sequence, added music
	Sitting Dream - add music
	Collect questionnaires

WEEK 6

5/20/96

Walk 2 laps of the AAC

Discuss questionnaire results

Week 6 Lesson 1

Dream sequence recovery from floor

Aerobic sequence with music -Joy

Neck circling with relaxation

5/22/96

Standing warm ups for Aerobic sequence

Aerobic sequence with music

Elastic rope sequence

Exercises - sitting in position C,D,E,F

(40 - 51, 53-56, 61, 71, 72, 77 - 85)

Spine flexibility

Standing Dream with music

Floor exercises and relaxation

Assigned reading: Index

5/24/96	Brisk walking to music
	Foam ball passing in circles
	Aerobic sequence
	Sitting Dream
	Week 6 Lesson 1
	Assigned reading: Foot care

WEEK 7

5/27/96	Foot Care Day-explained importance of proper foot care
	Hedy spoke about reflexology and massage of feet
	Review walking styles
	Foot exercises
	Marble activity
	Assigned reading: Foot care, Falls and Recovery
5/29/96	Brisk walking with music - posture check
	sitting exercises
	Dream sequence with music
	Work on falls and recoveries
	Elastic rope sequence with music
5/31/96	Walk 4 laps around AAC
	Sitting, standing and floor exercises
	(88-96, 98-101, 104-106, 111-123, 133-136)
	Aerobic sequence - Joy
	Wand sequence with music
	relaxation

Assign reading: coordination

WEEK 8

6/3/96

Walk 4 laps around AAC

Wand exercises with music

Elastic rope sequence with music

Week 6 Lesson 1

Sitting part of TV tingle

Assigned reading: Release of Tension, Flexibility of the back

6/5/96

Jump rope activity

Balloon activity

"Follow the Leader" - with music

Sitting Dream - with music

TV tingle

Floor rest with music

Discuss reading assignment

6/6/96

Walk 3 laps in AAC

Standing exercises

Aerobic sequence with music

Floor exercises with Dream sequence recovery

Dream sequence with music

TV tingle

Elastic rope sequence with music

Chair relaxation with music.

APPENDIX B

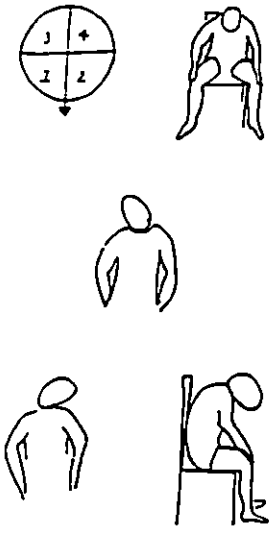
All exercise descriptions and pictures:

Chrisman, D.C. (1994). Body recall: A program of physical fitness for the adult. Lafayette, IN: Lafayette Printing Company, Inc.

BODY RECALL EXERCISES WHICH WERE MODIFIED

73 Modification: Did not turn head back

Head circling



Start: Sitting position B with hands cupped over knees.

Totally relax the body in a comfortable, secure posture. Let the head hang forward with shoulders relaxed. Separate the legs for stability. Hang loosely in the upper back and close the eyes. Feel total release of tension throughout the body. Feel your neck elongated as it hangs forward. Relax the muscles of the face and jaw. Move the right ear over to the right shoulder very, very slowly and smoothly. Stop and rock slowly back and forth over every place that seems tight and sensitive. The idea is to produce free and painless movement in the neck. Return to forward hanging of head. Repeat.

Move the left ear over to the left shoulder in the same manner, twice. Allow the head to move from side to side very slowly and with complete relaxation in the neck and shoulders. Take lots of time and think about releasing tension in the upper back, shoulder and neck areas. The first time you do the head circling exercise, moving from side to side with head forward, is a good beginning. Be very honest with yourself in allowing the total weight of the head to be carried along by the neck. Finish by letting the head hang loosely forward. Feel the stretch deep down between the shoulder blades. Coach yourself in a very calm way. You cannot rush this process, but it is well worth the time and trouble it takes!

This exercise includes a ½ circle. Continuation to describe a full circle with the head should proceed in the same slow and smooth manner, ¼ circle at a time. When circling around in the back, be certain the shoulders are slumped forward. Place hands over the knees and relax the arms totally. Adjust back, hips and legs to gain stability as well as relaxation while seated in the chair.

95 Modification: Made sure back did not arch

Straight leg lift backward

Start: Standing position A.

With weight on the left foot, lift the right leg straight back as far as it will go and return to starting position. Do four lifts with the right leg before changing to lift the left leg four times. Repeat on both legs. Keep the upper body erect and steady.

99 Modification Did not let knees move beyond toe

Alternate leg straightening from half-knee bend

Start: Standing position A. Bend both legs to half knee.

Straighten right knee, pressing the leg into the right hip joint. Return to half-knee position. Straighten left leg in the same manner. Keep the upper body facing forward throughout. The hips will shift position at the base of the spine. Keep the upper body stable. This is a coordination exercise as well as being beneficial for legs and hip flexibility and strength. Count to four, starting in the half-knee position. 1: right knee straight. 2: both knees bent. 3: left knee straight. 4: both knees bent. Repeat four times.

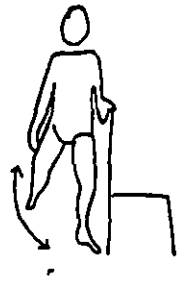
105 Modification: Did not arch back

Leg swinging

Start: Standing position C, left side to chair back. Weight on left leg.

Swing right leg forward and back like a pendulum. Keep leg straight on backward swing. Count to eight. 1: forward swing. 2: back. 3: forward. 4: back, etc. Turn body in opposite direction and repeat with other leg. Hold the upper body erect and as steady as possible. Variation: Swing straight arm forward and back with the swinging leg. Swing arm in opposition to the leg swing.

The swinging movement contributes to less friction, and release of tension in the hip and shoulder joints. Try to allow free movement in the joints.

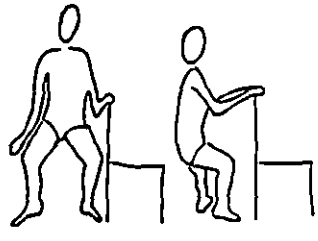


106 Modification: Knees over ankles, no bounce, smooth movements up and down

Plié bounces

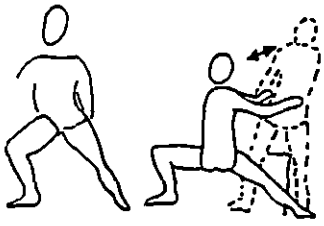
Start: Standing position A, feet placed shoulder width apart.

Turn toes outward, bend both knees to lower in a wide half-knee bend. Be sure knees bend in the same direction the toes are pointed. Keep feet flat on the floor, seat tucked under, upper body upright and knees bent directly over balls of the feet. Gently bounce in the knees four times and straighten both legs to return to the starting position. Repeat. Do this exercise slowly and smoothly.



107 Modifications: Knee over ankle

Lunges



Start: Standing position A.

Lift right foot off floor and reach to the side with a wide step. Transfer all the body weight to the right foot as it touches the floor. Bend the knee of the right leg at the moment of floor contact. Left foot remains on the floor. Push off from the floor with the right foot to return to starting position. Repeat to left side. Repeat three more times. Variation: From starting position C lunge forward and transfer weight on forward leg while keeping the rear foot on the floor for balance.

Keep the movement smooth. Absorb the sudden weight shift by bending the forward knee slightly. Return to starting position without slowing the flow of movement. Count to four. 1: lunge. 2: back and change legs. 3: lunge. 4: back and change. Repeat as desired and increase the distance between the feet when lunging.

109 Modification: No arch in back

Knee lift and swing backward

Start: Standing position A. Step back from the chair support.

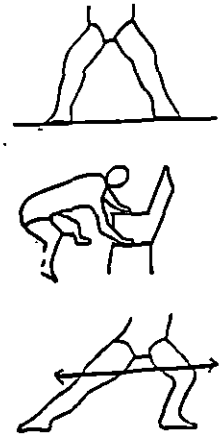
Stand on left leg, bend right knee up to the chest. Let the leg swing down under the body while straightening the knee for a swing backward as far as the leg will go. Repeat three more times. Do not stop the motion until all repetitions are complete. Keep the upper body erect. Do not let the chest move toward the lifted knee. Do not arch the back as the leg moves backward. Change legs.

110 Modification: Knees over ankles

Alternate leg straightening from low plié

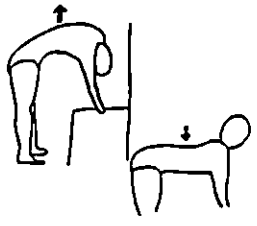
Start: Standing position D with feet in wide stance.

Bend knees over turned out toes. Keep feet flat on the floor throughout. While remaining low, straighten the right leg and shift weight over the left bent knee. Return the weight to center position where it is equally distributed between the feet. Straighten the left leg shifting all the weight over the right knee. Return to center. Keep the back straight throughout, hips tucked under. Repeat, shifting weight back and forth to eight counts. 1: right leg straight. 2: center. 3: left leg straight. 4: center, etc. Keep the action clean-cut. Shake out the legs to relieve tension when finished.



112 Modification: Knees slightly bent

Spine flex and extend

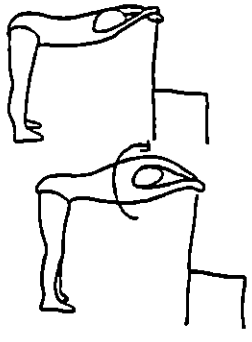


Start: Standing position D with feet apart.

Keep the hands on the sides of the chair seat. Pull the back up like a Halloween cat, head drops forward so you can look into the lap. Lift the head, press down in the small of the back and arch like a swaybacked horse. Move smoothly and slowly. Get as much action in the back as possible. Repeat three times. The arms and legs remain straight throughout.

113 Modification: Knees slightly bent

Torso twist



Start: Standing position A with hands crossed in center of chair back. Stand with feet apart.

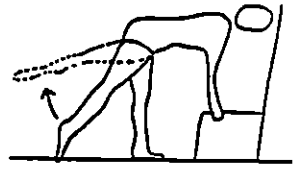
Bend forward at hips, keep legs straight and arms fully extended. Put head down between arms. Rotate the shoulders and look to the right. Return to center and rotate to look left. Do not turn head. The rotation of the upper body produces all the movement. Do not shift weight into the hips. Count to eight. 1: face right, 2: face left, 3: face right, etc. Move slowly.

114 Modification: No arch in back

Start: Standing position D (Hands on each side of the seat.)

Place hands directly under the shoulders on the sides of the facing chair seat. Keep legs straight throughout. Extend the right leg backward until just the toes rest on the floor. Lift the right leg backward from the hip four times consecutively. Change legs. Keep the back straight and head in line with the spine. Count to four, lifting leg on each count.

Single leg lift to the rear



126 Modification: Knees bent, no bounce

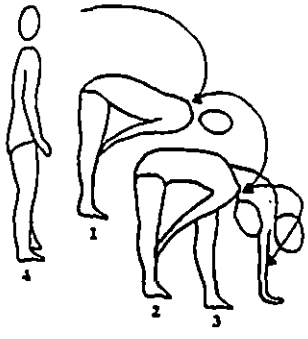
Side bounces

Start: Free standing position A, hands on hips

Bend directly to the side, nudging three times as you go. Stand up straight and bounce three times while bending sideways to the other side. Count to four. 1, 2, 3: bounces, 4: stand up. Repeat two times on each side. Variations: 1) One arm over-head reaching on stretching side. Keep the chest facing straight ahead and reach to the ceiling with the arm opposite the bend. Stretch the arm over the head with fingers pointing in the direction of the bend. Stand up slowly while changing sides of bend and arm action. Count to four as above, and repeat two times on each side. 2) Try two arms over head as you bend sideward gently. Alternate from side to side like swaying. Keep head and shoulders in good alignment, and keep seat tucked under.

135 Modification: Knees bent

Knee, shin and floor touch



Start: Free standing position A.

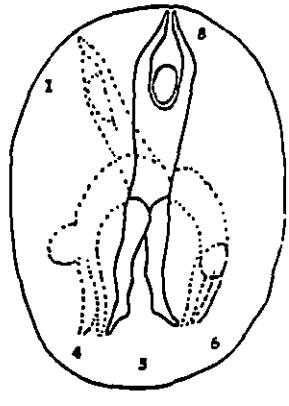
Lean forward and touch finger-tips to knees Go a little further and touch the shins. Finally attempt to touch the floor. Count to four. 1: knees. 2: shin. 3: floor. 4: stand up. Repeat three times. Keep legs straight throughout.

136 Modification: Knees bent

Around the world

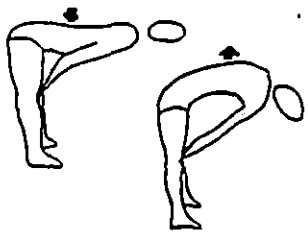
Start: Free standing position A with arms reaching over head, thumbs hooked.

Start toward the right to describe a large circle that will take the hands to the outside of the right foot, then between the feet on the floor in front, then outside of left foot and stretching upward slowly for the continuation of the circle. Count to eight. 1, 2, 3, 4: to touch right foot, 5: center, 6: left foot touch, 7 & 8: finish circle over head. Reverse direction and repeat on other side. Move slowly and smoothly. Keep legs straight throughout. Stretch and reach with the arms and hands at all times.



139 Modification: Knees bent

Round and straight back



Start: From standing position 8 with hands on knees, arms straight. (Do not push on knees.)

Straighten back so it is parallel to the floor, pinch the shoulder blades together, keep the head in line with the spine. Round the spine like a Halloween cat back, humping as much as possible with head forward and chin tucked in. Keep the hands on the knees throughout. Press down in the small of the back to return to starting position. Repeat three times. Exaggerate the straight back by pressing in the small of the back like a sway-backed horse. Keep the legs straight throughout and make the back do all the work. Get as much action as possible in the spine. Bend knees before standing upright.

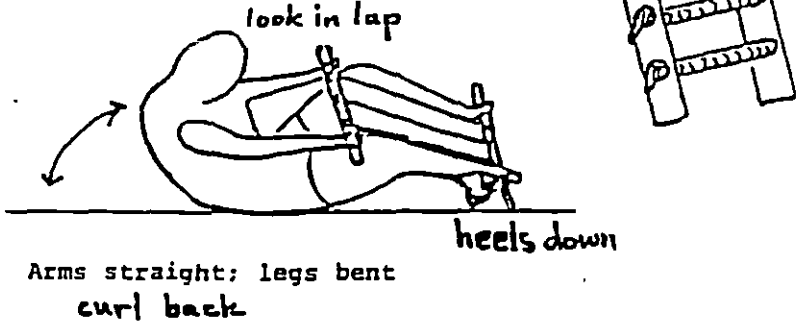
Sit up stick

Replaced this exercise for ease, comfort and to isolate abdominals and not hip flexors. Performed crunches instead, lifting up until shoulder blades just raise off the floor, keeping neck in line with the spine.

Sit-Up Sticks

Spine flexibility

Abdominal tone



Arms straight; legs bent

curl back

Tuck your chin to your chest while you rotate your pelvis forward. Ooaz down, keeping round, with your head resting last. As you come up, lift your head to your chest and "push" that stick forward until you are sitting up. Go very slowly and with control. Start with a couple and increase gradually.

APPENDIX C

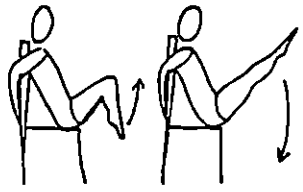
All exercise descriptions and pictures:

Chrisman, D.C. (1994). Body recall: A program of physical fitness for the adult. Lafayette, IN: Lafayette Printing Company, Inc.

BODY RECALL EXERCISE NOT USED

43 Did not use because of pressure placed on back

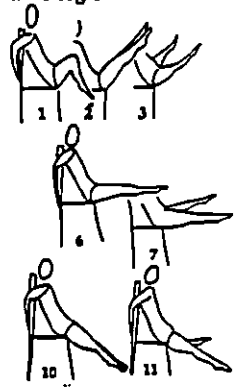
Double knee lift, leg extension and lower



Start: Sitting position C.
Scoot hips under firmly. Lift both knees to the chest. Straighten both legs in line with the angle of the thighs. Lower legs to floor slowly and smoothly. Do this to four counts. 1: lift. 2. extend legs. 3 & 4: lower legs and place feet on floor. Count 4 while resting before repeating exercise. Repeat three times. Remember to place the feet on the floor. Do not let them flop.

48 Did not use because of pressure placed on back

Double leg strides three levels



Start: Sitting position C.
Bend both knees to the chest, extend the legs until they are in line with the thigh and point toes high. Separate legs briskly as wide as they will go and bring them together before bending knees to chest again. Straighten legs parallel with floor and separate legs vigorously to the side in a stride. Bring legs together while bending knees to chest. Extend legs to 6" from floor. Swing legs to a stride position and back together before lowering the feet to the floor slowly. Do this to 12 counts. 1: lift knees to chest, 2: straighten legs high. 3: stride. 4: legs together. 5: bend knees to chest. 6: extend legs in front parallel. 7: stride. 8: together. 9: bring knees to chest. 10: lower legs straight just above the floor. 11: stride. 12: together and rest the feet on the floor. Keep a good tuck of the peivis, and do not hold your breath!

55 Did not use because of balance and pressure placed on back

Scissors, parallel

Start: Sitting position C with both legs extended forward.
Separate straight legs to a stride position as far as they will go. Bring legs back together, crossing right leg over left and left under right. Keep legs straight throughout and move legs to the maximum out and in. Repeat crossing left leg over right, etc. Do exercise eight times. 1: stride. 2: cross, 3: stride, 4: cross, etc.

64 Did not use because created contraindicated position

Side bend with upper arm reach

Start: Sitting position B with arms held at shoulder level to the sides.

Bend to the right side and rest right forearm on the floor. The left arm is straight up. Stabilize the body with the right hand while reaching over the head with the left arm. Keep left arm straight and with gentle stretches, continue to reach until it is parallel with the floor. Return arm to the straight up position before sitting up. Repeat on left side. Proceed very slowly and deliberately. Back should remain in contact with the chair.

84 Did not used because of awkwardness

Single leg lift to chair back

Start: Sitting position F with arms straight, torso leaning back.

Straighten right leg and swing it over the nearest corner of chair back to touch the back of lower leg. Return foot to the floor. Repeat with left leg. Do not flop foot on floor. Control foot placement. Firmly grip the chair back with hands leaving room for the leg to touch at the corners. Repeat with each leg. Do this to 4 counts. 1: touch right leg to chair back. 2: place right foot to floor. 3: touch left leg. 4: place left foot. Repeat. The torso will swing from side to side to facilitate a smooth leg lift.

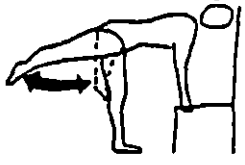
Variation: Swing leg entirely over back of chair to cross the knee of the other leg. Release hands from chair back to accomplish this and replace them for stability as needed. Lift leg off the knee and swing it back to start. Change legs. Repeat 4 times.

115 Did not used because of the position the swinging creates

Leg lift backward and sweep to side

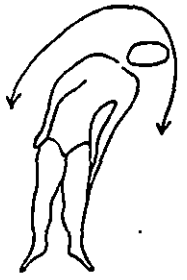
Start: Standing position D.

Stand on left foot. Straighten right leg to the rear and place extended toes on the floor. Lift the right leg as far as possible, sweep it to the right and back, touch the toe to the floor to finish. Repeat 4 times. Keep the back straight and parallel to the floor with head up. The arms should remain straight also. Change legs.



125 Did not use because considered contraindicated by national standards

Side bends



Start: Free standing position A.

Bend to the left, gently, while sliding the left hand down the side of the left thigh to the knee joint. Slowly return to an upright standing position. Keep the head in alignment with the spine as it bends. Bend to the right side in the same manner. Repeat the exercise with a greater reach of the finger tips down the side of the leg. Keep legs straight. Bend directly sideward with no twist in the upper body and hip. Count four slow counts down, four slow counts up. Do this exercise four times, alternating sides of the body.

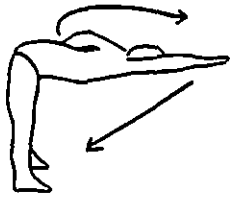
130 Did not used because of the contraindicated movement on the spine

Elbow pivot

Start: Free standing position B.

Twist the torso and try to point one bent elbow toward the floor while the other points to the ceiling. Rotate the spine and exchange elbows. Keep hands on hips throughout. Repeat three times, counting to eight, one exchange for each count. Let the head follow the twist. Go slowly and smoothly. Do avoid dizziness. Bend knees before curling to upright stance.

131 Did not used because of the contraindicated movement on the spine



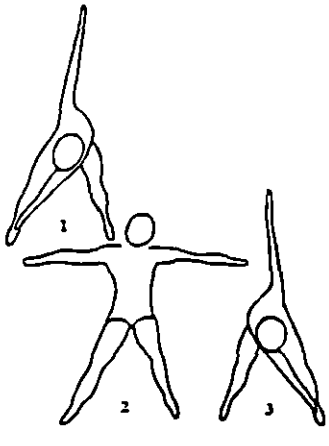
Start: Free standing position B, reaching forward with one arm parallel to the floor.

Alternately reach forward with straight arm. Draw the arm down and backward until the hand is by the hip. Lift the elbow to the ceiling and reach forward again with a straight arm. At the point one arm is lifting with the elbow the other arm is reaching as far forward as possible. Keep the action smooth and moderately fast. The legs may be straight or relaxed, standing in forward-back stride or feet parallel. Count to eight with a strong forward reach for each count. Bend the knees while rising to a stand very smoothly and slowly.

This exercise is more vigorous than all the others. The pumping action of the arms will increase circulation in the upper body and will slightly increase the heart and lung activity. This is a good warm-up exercise. It is like a dry land swim. You gain strength in the lower back any time you lean forward with a straight back and resist gravity. When legs remain straight while the torso is bent forward the hamstrings of the legs are lengthened and strengthened.

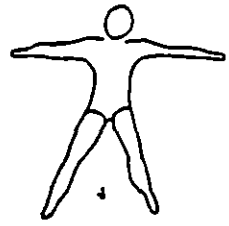
134 Did not use because considered contraindicated by national standards

Alternate toe touching



Start: Free standing position with arms shoulder height at sides.

Twist the torso and take the left fingers to the right foot, keeping the legs straight. Rise and bend to touch the right fingers to the left foot. Return to the starting position after each touch. Hold arms sideward throughout. While one arm is reaching to the floor the other is reaching to the ceiling. Count 1 & 2, touch toe, 3 & 4, stand. Repeat on other side.

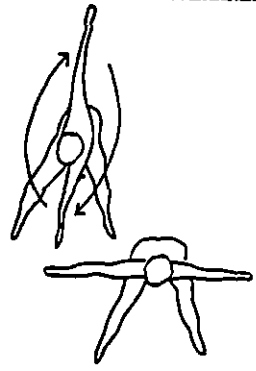


137 Did not use because considered contraindicated by national standards

Windmill

Start: Free standing position B with arms held out to sides even with shoulders.

Twist the torso so right hand points to floor between feet, left hand points to ceiling. Remain in forward bend position and twist the torso so left hand is in low center: right hand is high center. Rotate the spine from side to side in this manner for eight counts, one change for each count. Bend knees and rise slowly to an upright position.

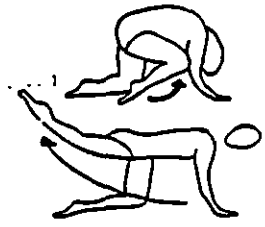


143 Did not use because considered contraindicated by national standards

Flex knee, extend leg

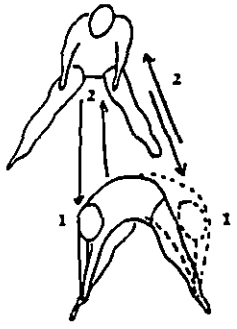
Start: Kneeling position with hand support.

Bend right knee to chest. Keeping it bent, straighten out the hip while swinging the bent knee under the body to straighten for an extended leg lift. Return to bent knee at chest. Keep a smooth swinging action in the hip joint. Lift as high as possible when the leg is extended. Tuck the chin in and round the back as the knee comes to the chest. Count two. 1: flex knee. 2: extend leg. Repeat three times. Change legs.



166 Did not used because movement is too advanced and needs modifications

Alternate head to knee bounces in stride position

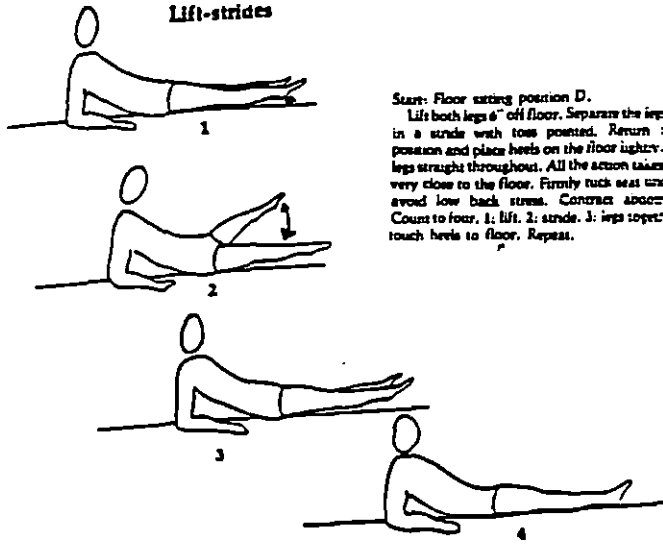


Start: Floor Sitting position B with legs separated wide in stride.

Drop over to the right leg with upper torso, round back and head forward. Return to high sitting position. Drop over the other leg in the same manner. Count to eight. 1: bend over right leg, and sit up, 2: bend over left leg, and: sit up. This is an advanced exercise and should be preceded by exercise 164 or 165.

172 Did not use because considered contraindicated by national standards

Lift-strides

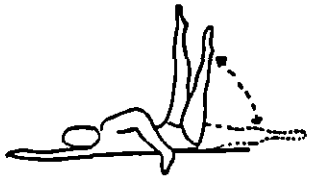


Start: Floor sitting position D.

Lift both legs 6" off floor. Separate the legs wide in a stride with toes pointed. Return to [illegible] position and place heels on the floor lightly. Keep legs straight throughout. All the action takes place very close to the floor. Firmly tuck seat under to avoid low back stress. Contract abdominals. Count to four. 1: lift. 2: stride. 3: legs together & touch heels to floor. Repeat.

177 Did not use because considered contraindicated by national standards

Bottom leg lift



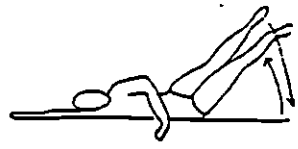
Start: Side-lying position A.

Lift top leg at a 90 degree angle, toes pointed to ceiling. Lift bottom leg up to touch the top leg. Lower just the bottom leg. Repeat and lower both legs together. Roll over, straighten legs out, lift top leg and leave it high. Bring bottom leg up to touch the top leg. Lower. Repeat and lower both legs together. Increase these to four lower leg lifts as it is possible.

178 Did not use because considered contraindicated by national standards

Double leg lift sideward

Start: Side-lying position A.
Keep both legs together and straight. Slowly lift both upward and lower to the floor. Count four to lift and four to lower. Control the action carefully. Do not flop legs on the floor. Stabilize the body with the forward bracing hand. Roll over and repeat on other side. Increase to four in succession as it is possible.



186 Did not use because considered contraindicated by national standards

Double arm lifts

Start: Face-lying position B, arms extended over head with hands on floor.
Raise extended arms from the floor as high as possible. Chest lifts at the same time. Keep feet on the floor throughout. Return to starting position. Repeat. Rest.

187 Did not use because considered contraindicated by national standards

Swan

Start: Face-lying position B, arms to sides, shoulder level.
Raise chest and arms from the floor as high as possible. Lower to start. Count four. Raise slowly on two counts, lower on two counts. Repeat two times. Increase as ability allows. Keep feet stationary while the chest is lifted.

188 Did not use because considered contraindicated by national standards

Head lift

Start: Face-lying position A.
Lift chin from hands as high as it will go. Place back to starting position. Repeat six times.
Variation: Lift head as high as possible, turn to one side and rest cheek on hands. Lift head again and lower cheek to hands and rest. Move slowly and try to release all tension during the rest phase.

191 Did not use because considered contraindicated by national standards

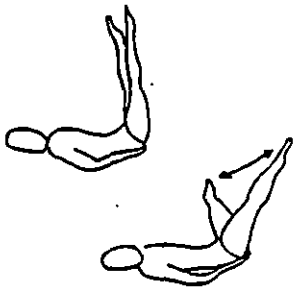
Double leg lifts

Start: Face-lying position A.
Lift both legs at the same time, hold for 1 count and place legs on floor. Count to two. 1: lift, 2: place, etc. Repeat three times keeping chest on floor.

196 Did not use because considered contraindicated by national standards

Stride legs

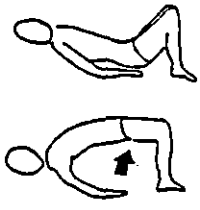
Start: Back-lying position B with hands under hips.
Extend legs upward at a 90 degree angle. Point toes and keep the legs straight while separating them sideways as far as possible in a stride position. Bring the legs in and cross them as far as possible still keeping them straight. Stride legs and cross them again. Count four. 1: stride, and: cross, 2: stride, and: cross, etc. Increase number as interest and ability allow.
If abdominals are weak it will help to elevate the hips allowing legs to remain at right angles to the torso. Try the exercise with hands under hips and without to determine your need. As abdominals strengthen, there will be no need to prop up the hips.



200 Did not use because considered contraindicated by national standards

The bridge

Start: Back-lying position C.
Slowly lift the hips as high as they will go, arching the back if possible. All body weight is supported by the shoulders and feet. Lower back slowly to the floor by uncurling the spine from the shoulders down, one vertebra at a time. Count four to raise, four counts to lower. Repeat three times. Relax the arms and neck while the rest of the body works.



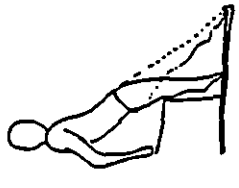
201 Did not use because considered contraindicated by national standards

Bridge with alternate hip flex

Start: Back-lying position C.
Lift hips off the floor and support all weight on feet and shoulders. Pick up right foot and pull right knee back toward chest, maintaining high arch throughout. Do not sag. Place right foot on floor and pick up left in the same manner. Return to starting position and rest. Move slowly and deliberately through each step. Count to eight. 1: raise hips. 2: flex right hip (knee pulls back). 3: place right foot. 4: flex left hip. 5: place left foot on floor. 6, 7, 8: return to floor. Repeat.

202 Did not use because considered contraindicated by national standards

Bridge with chair support



Start: Back-lying position C with lower [illegible] supported by chair.
Lift the hips as high as they will go and rest them to the floor slowly. Count four to raise and four to lower. Keep the movement smooth as attempt to curl up and down by moving one vertebra at a time. Variation: Lift hips to bridge position. Straighten the right leg and touch the chair back with the pointed toe. Replace the leg on chair and repeat with left leg. Keep the hips arched throughout. Return to floor and rest.

204 Did not use because considered contraindicated by national standards

Head lift with chin tuck

Start: Back-lying position A.
Lift only the head from the floor, tuck the chin toward the chest and return the head to the floor. Rest. Count to four lifting, four counts lowering. Repeat four times.

206 Did not use because considered contraindicated by national standards

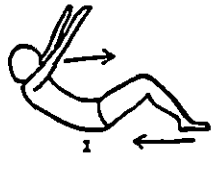
Head and shoulder lift

Start: Back-lying position A.
Lift head and shoulders off the floor until the feet start to come up. Keep arms straight as the hands slide down the thigh. Hold the shoulders in lifted position then return slowly to the floor. Relax. Remember to reach forward with the head as the shoulders curl up. Uncurl the shoulders to the floor before allowing the head to touch the floor. Repeat three times. Increase the length of time the highest position is held. Count to eight. 1 & 2: raise head and shoulders. 3 & 4 hold position. 5-8: lower slowly to the floor. Rest.

208 Did not use because considered contraindicated by national standards

Sit-ups, arms over hea

Start: Back-lying position A with arms over head.
Raise arms forcefully and throw them forward as head and shoulders come off the floor. Tuck the chin, reach forward with arms and sit up with the momentum. Bend knees as the body comes to a sitting position, wrap arms around the knees. Slowly uncurl to the starting position. Rest. Repeat. Count to eight. 1: throw arms forward. 2: sit up. 3, 4, 5, 6: slowly uncurl to the floor with back, shoulders and head, taking arms to the floor at the sides. Counts 7 & 8: raise arms overhead in an arc. Keep them straight.
Repeat.



APPENDIX D

WATER AEROBICS EXERCISE LOG

All cardio movement done for approximately one minute. Stretches are head for 10 seconds (after warm-up) and then 15 seconds (after cool down). Eight repetitions are performed for Arm and leg exercises (build up to 8). Arthritis exercises are done jogging(H).

4/15/96	Introduction to water; warm up (see Appendix G); stretch (see Appendix H): walking, jumping jogging. Cardio exercise :A, C, D, J , I. (see Appendix I); Arthritis stretches (see Appendix K); cool down (see Appendix J); leg exercises (see Appendix L); (20 minutes of Cardio)

From here on out, the warm up, stretch, and cool down are the same everyday.

4/17/96	Warm up; Stretch ; Cardio exercises A, B, E, H, J, L (see Appendix I); Cool down, leg exercises (see Appendix L); stretch. (20 minutes of Cardio)
4/19/96	Warm up; stretch; Cardio exercises A, B, C, D, E, H, J, L (see

Appendix I); Cool down ; leg exercises; stretch.
(22 minutes of Cardio)

4/22/96 Warm up; stretch; Cardio exercises A, B, C, D, E, H, J, L ; Cool down ; arm exercises (see Appendix M); leg exercises; stretch. (22 minutes of Cardio) .

4/24/96 Same as 4/22/96 (30minutes of Cardio)

4/26/96 Warm up; stretch; Cardio exercises A, B, C, D, E, F, G, H, I, J,K, L, M (see Appendix I); Cool down ; arm exercises; leg in final stretch: arm behind/neck, Mae West, bear hug. (see Appendix H).

4/29/96 Warm up; stretch; Cardio exercises A, B, C, D, E, F, G, H, I, J,K, L; Cool down ; arm exercises; leg exercises; abdominal squeeze (with back pressed against wall); stretch. (30 minutes of Cardio)

5/1/96 Same as 4/29/96. Times and reps now: 30 min. Cardio; 8

5/3/96 - 5/29/96	Same as 5/1/96.
5/31/96	water too cold to exercise
6/3/96	Informed pump on pool broke. Pool closed for at least 8weeks.

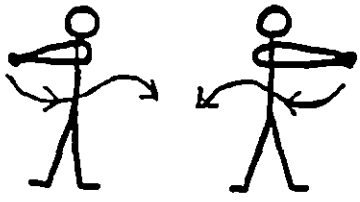
APPENDIX E

WARM UP EXERCISES

Jog laps, using the width of the pool instead of the length. First lap: jog forward with arms pumping at side. Second lap: jog backwards with arms pumping at side. Third lap: jog forward with arms performing breast stroke motion. Fourth lap: jog backwards with arms performing breast stroke motion.

FIGURE 8

Feet should be planted shoulder-width apart, arms extended out in front and hands clasped together. Moving from the shoulder, trace figure eights with arms. Continue movement for 30 seconds or more then reverse.



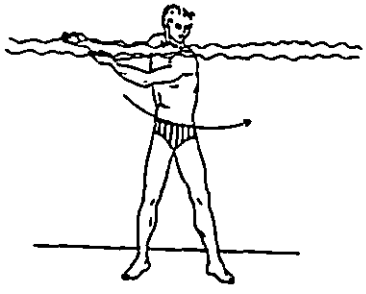
United States Water Fitness Association, Inc. (1996). National water fitness instructors manual. Boynton Beach, FL: United States Water Fitness Association, Inc.

ARM LIFT AND PRESS

Standing with feet shoulder-width apart, hold your arms out in front with hands clasped together. Press arms downward forcefully and sweep them upward with equal intensity.

United States Water Fitness Association, Inc. (1996). National water fitness instructors manual. Boynton Beach, FL: United States Water Fitness Association, Inc.

GOLF SWING



Basic Exercise

1. Swing your arms to one side of the body and up as high as possible.
2. Reverse the motion to the opposite side of the body.
3. This left-to-right motion should be done in a vertical plane.

Variation

Shorten the distance of the swing motion and speed up the movement.

Krasevec, J.A. & Grimes, D.C. (1985). HydroRobics. (2nd. ed.).Champaign, IL: Leisure Press.

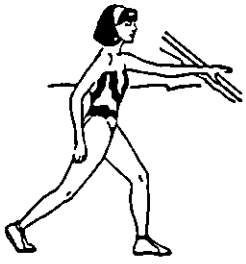
STRETCHES

Straight Leg Calf Stretch

Starting Position: After the Hip Flexor Stretch (Move #17), you are standing with one foot in front of the other. Move your back foot a bit closer to the front foot.

Action: Press your heel down to the floor. Be sure that your back foot is pointing straight ahead and that your front knee is over your heel rather than over your toes. Relax your calf muscle at the back of your lower leg. Optional: Press your other palm toward the pool wall, then away from it in time to the music.

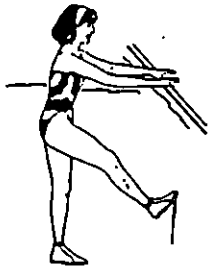
Hip Flexor Stretch



Starting Position: Hold on to the pool edge and pivot turn on your toes to face the pool wall. Stand with one foot in front of the other at a comfortable distance.

Action: With your front knee bent, straighten your back leg, and raise your back heel (you are on the toes of your back foot). Pull in your abdominals and gently press your hips down and forward to stretch the hip flexor muscles that run from your torso to the front of your thigh. Optional: With your free hand (the one not holding the pool edge) press your palm toward the pool wall, then away from it in time to the music.

Hamstring Stretch



Starting Position: Face the pool wall.

Action: Place your right foot against the wall at a height that allows you to straighten your leg comfortably without locking or hyperextending the knee. Pull in your abdominals, keep your back flat, and lean forward from the hip. Relax and soften the muscles at the back of your thigh. Hold on to the pool edge for stability.

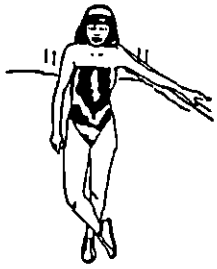
Full Back Stretch

Starting Position: Continue facing the pool wall with both hands holding on to the edge.

Action: Lower yourself into the water and place your feet more than shoulder-width apart against the wall. The water will buoy your body. Relax and soften the muscles of your entire back.

Gaines, M. P. (1993). Fantastic water workouts. Champaign, IL: Human Kinetics.

Shin Stretch and Shoulder Shrug



Starting Position: Turn your body so that you are standing with your left side toward the pool wall.

Action: Cross your outside leg over your inside leg. Point your toes and place the tops of your toes on the floor of the pool. Breathe deeply and relax your shin.

While you stretch your shins, slowly raise both shoulders toward your ears, then slowly depress your shoulders. Repeat slowly in time to the music.

Outer Thigh Stretch

Starting Position: Stand with your left side toward the pool wall, holding on to the pool edge with your left hand.

Action: Stand up straight and cross your outside leg over the leg nearest to the side of the pool. Reach out toward the middle of the pool with your free arm and lean your hip in toward the pool edge. Optional: Cup your hand and press your palm toward the wall. Turn your palm around and press away from the wall. Repeat this arm action slowly, in time to the music if you are using it. Relax the muscles on the outside of your left thigh and hold the stretch position, without bouncing, for approximately 10 seconds, or for about 16 beats of the music (remember: 10 seconds for Warm-Up Stretches; 20 to 30 seconds for Cool-Down Stretches).

Lower Back Stretch with Ankle Rotation

Starting Position: Hold on to the pool edge. Stand up straight and firmly contract your abdominal muscles.

Action: Lift your right leg. Reaching your arm behind your thigh, draw your knee toward your chest as you relax your lower back. Slowly roll your foot in a circle counterclockwise for several revolutions. Then roll it clockwise. Rotate the ankle through your full range of motion. (Roll it in as wide a circle as possible without causing pain.)

Lean forward from the hips with a flat back and relax your lower back.

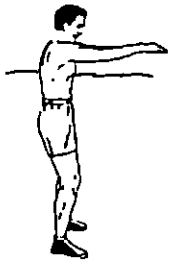
Front of Thigh Stretch

Starting Position: Turn your back to the wall and stand about 18 inches or 1/2 meter from it. Hold on to the pool edge with your outstretched left arm and place your left foot on the wall behind you.

Action: Standing up straight, squeeze your abdominal muscles in tight and push your hips away from the wall so that your knee joint forms a right angle. Breathe deeply and relax the front of your thigh.

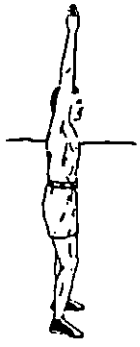
Gaines, M. P. (1993). Fantastic water workouts. Champaign, IL: Human Kinetics.

Move #26: Upper Back Stretch



Action: Bring your arms forward, reach out in front of your chest, and link your thumbs. While standing up straight, contract your abdominal muscles, round your upper back, and look down at the floor of the pool. Relax the muscles of your upper back, neck, and shoulders. Be sure to keep your shoulders down.

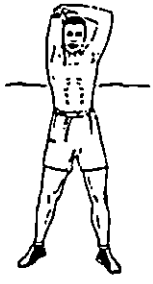
Move #27: Torso and Shoulder Stretch



Action: Contract your abdominal and buttocks muscles to brace your spine. Bring your arms out to the sides. Then raise your arms overhead and link your thumbs together. Lift your chest as you reach toward the sky. Flex the knees slightly and bring your arms next to your ears being careful not to arch your back or drop your head. Breathe deeply and hold the stretch for 16 counts.

Safety Tips: Keep your elbows slightly bent to avoid stressing the elbow joint. If your shoulders feel tight, lower your hands in front of your face until the tightness disappears.

Move #28: Shoulder and Upper Arm Stretch



Action:

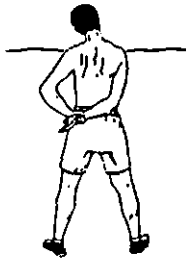
1. Reach behind your neck with your right hand.
2. Clasp your right elbow with the left hand. Draw your right elbow toward your head, just to the point of comfortable resistance. Relax your shoulder and upper arm. Keep your head up straight to protect your neck.
3. Extend your right arm.
4. Repeat the sequence with the left arm to stretch the other side.

Gaines, M. P. (1993). Fantastic water workouts. Champaign, IL: Human Kinetics.

SUPPLEMENTAL COOL DOWN STRETCHES

Now add these neck, shoulder, and upper back stretches to improve flexibility in areas that often become tense.

Move #72: Safe Neck Stretch



Starting Position: Stand with feet shoulder-width apart in the braced neutral position.

Action 1: Reach behind your back and bring your right arm toward your left hip. Gently grasp your right wrist with your left hand. Slowly lower your left ear toward your left shoulder. Hold for 20 to 30 seconds, then return your head to an upright position. Repeat the stretch on the opposite side.

Action 2: Reach behind your back and bring your right arm toward your left hip. Gently grasp your right wrist with your left hand. Slowly turn your head so that you are looking toward your left shoulder. Hold for 20 to 30 seconds, then turn your head slowly forward. Repeat the stretch for the opposite side.

Safety Tips: Remember to stretch *only to the point of comfortable resistance*. If you feel pulling or pain, you are stretching too far. Slowly reduce the amount of stretch. Move *very slowly* from one position to the next, or you will be injured.

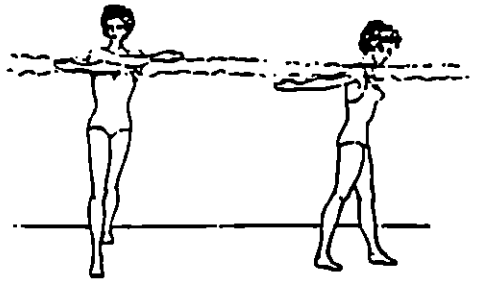
Move #73: Shoulder Hug

Starting Position: Stand with feet shoulder-width apart in the braced neutral position.

Action: Reach both hands across your chest and back toward your shoulder blades. Relax your upper back while you hold the stretch for 10 to 15 seconds. Switch arms, putting the other arm on top.

Gaines, M. P. (1993). Fantastic water workouts. Champaign, IL: Human Kinetics.

MAE WEST



BODY PARTS	FITNESS LEVEL	FREQUENCY	SPEED
Neck shoulders	A	12	Moderate
Chest upper	B	10	Moderate
back	C	8	Slow

Starting Position

Stabilize your body by method #2. Extend straight arms in a crossed position in front of the body. Your hands are in a vertical, "thumbs up" position. Perform in shoulder-depth water.

Basic Exercise

1. In a sweeping motion, swing your arms behind you as far as possible. The higher your arms are angled during this motion, the more effective the exercise.
2. In a sweeping forward motion, thrust the arms back to the starting position.

Variation

Decrease the size of the sweeping movement by one half and increase the speed. This eliminates the crossing of the arms in front of the body.

Reminder

Maintain open palms to the direction of the movement at all times.

Krasevec, J.A. & Grimes, D.C. (1985). HydroRobics. (2nd. ed.).Champaign, IL: Leisure Press.

AEROBIC EXERCISES

A: Rocking Horse

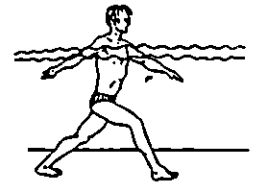
Standing in a forward facing lunge position with one leg in front of the other, separated about one foot. In a straight leg motion, rock from one foot to the other.

A1: Right leg forward, biceps curls with arms

A2: Left leg forward, triceps push backs

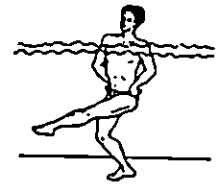
B: Cross Country Skiing

Stand in same position as in Rocking horse. In a straight leg motion, move legs, alternating, forwards and backwards. Opposite arm moves with opposite leg.



C: Forward Kicks

Alternating a straight leg kick from the hip. Alternating arms reach out in front so toes may touch hands.



D: Back Kicks

Alternating a straight leg kick from the waist in a backwards motion. careful not to arch back. Arms move in from the waist to the chest and then back out.

E: Side Leg Side

Straight leg kicks, toes forward, at the side. Alternate so one foot rests on the floor.

E1: Hands on waist

E2: Hands move together across body to surface and back down. palms facing one another.

E3: Same as E2 except palms facing apart.

E4: Same as E2 except arms behind body.

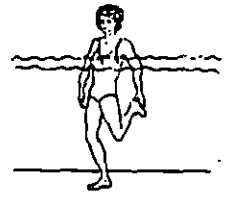
E5: Same as E3 except arms behind body

F: Ankle slaps

Legs move in the side leg side manner, except bend at knees so hand may touch ankle or toes

F1: Same side hand touches ankle

F2: Behind body, opposite hand to opposite foot



G: In step slap

Same movement as ankle slap, except in front of the body with the opposite hand touching the opposite instep.

H: Jog, heel landing on ground

H1: Hands press in and out at side
H2: Hands press up and down from the shoulder
H3: Alternate H1 and H2
H4: Hands move in and out from shoulder
H5: Alternate H2 and H5
H6: Arms bend at elbow, 90 degrees, move in and out. touching elbows
H7: Arms in same position as H6, with elbows touching at all time. clasping hands, moving up and down
H8: Arms extended at side, little pushes outwards
H9: Arms extended at side, rotating at shoulder
H10: Arthritis stretches

I: Hamster

A quick jog with high knees. Knees are apart. one in the 10 o'clock position and the other I the 2 o'clock position. Hands make quick circles around one another in front of the body.

I1: Arms move forward
I2: Arms move backwards

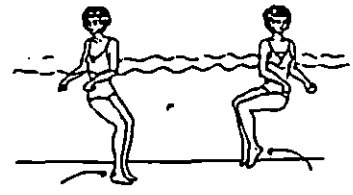
J: Frog

Legs in the same position as in the hamster, except instead of jogging. both feet push off the floor of the pool in a jumping manner. Knees are lifted high, abdominal tighten, palms push water downward in the front.

J1: Knees apart, hands in the center
J2: Knees together, hands on the outside of knees
J3: Alternate J1 and J2

K; Jumping
Legs together, jumping up and down, arms on waist

L: Downhill Skier
In a jumping manner, knees are brought up to the chest and then back down, angling feet to land on one side of the body and then the other. Subjects are told to imagine a log, and with keeping their torso still, in a jumping motion. move the feet from one side to the other. Straight arms move from side to side, opposite of feet.



M: Cheerleader
In a jumping manner legs move apart and then back together. Arms move up and down at side.
M1: Feet move apart and then back together. All done before feet touch the ground.
M2: Feet move together and then back apart. All done before feet touch ground.
(For those who were tired or not in that good of shape. feet touching between in and out was permitted.)

COOL DOWN

Cross country skier, rocking horse, jog to wall.

W: Walk four laps across pool

W1: Sideways, arm reaching out and then pull back in toward body as other legs move in to touch together.

W2: Moon walk, very large steps, opposite arms reaching forward

W3: Walk forward, arms move naturally at side

W4: Walk backwards, arms move naturally at side

Pictures A, M

Gaines, M. P. (1993). Fantastic water workouts. Champaign, IL: Human Kinetics.

Pictures B, C, E - G, I, L

Krasevec, J.A. & Grimes, D.C. (1985). HydroRobics. (2nd. ed.).Champaign, IL: Leisure Press.

Pictures D, H, K

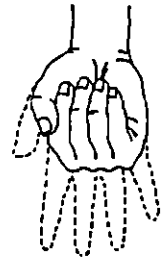
United States Water Fitness Association, Inc. (1996). National water fitness instructors manual. Boynton Beach, FL: United States Water Fitness Association, Inc.

ARTHRITIS STRETCHES

All exercises and descriptions

Gaines, M. P. (1993). Fantastic water workouts. Champaign, IL: Human Kinetics.

Move #74: Finger Curl



Action: Open and close your palms slowly. Make a loose fist.

Variation: Bend the larger knuckles of all four fingers and bring your fingertips toward the tops of your palms.

Move #75: Finger Touch

Action: Touch the tip of your thumb to each of your fingers one at a time.

Move #76: Thumb Circles

Action: Make large circles with your thumb.

Move #77: Toe Curls

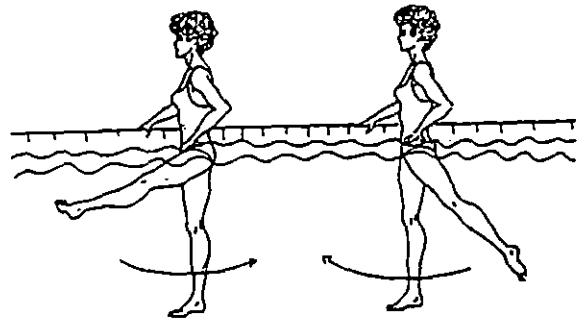
Action: Curl your toes down and then straighten them out. Exercise one foot at a time.

LEG EXERCISES

All exercises and descriptions

Krasevec, J.A. & Grimes, D.C. (1985). HydroRobics. (2nd. ed.).Champaign, IL: Leisure Press.

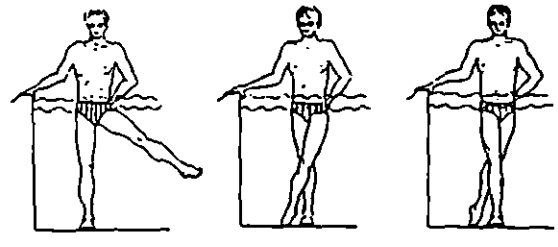
PENDULUM



Basic Exercise

1. While keeping your outer leg straight, move it forward (from the hip) and as far upward as your muscles will permit.
2. Still working from the hip joint, swing your leg from a forward to backward position, extending the leg as far backward as possible.
3. Repeat this forward and backward swinging motion with equal force.
4. Reverse body position and repeat exercise with outer leg.

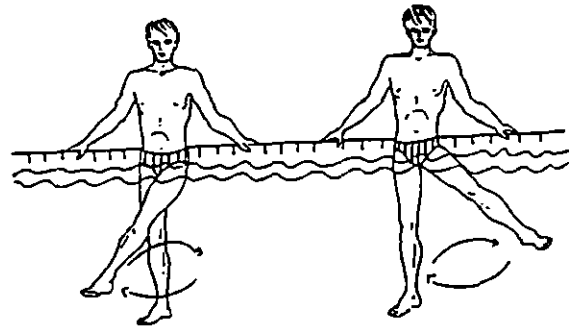
LATERAL LIFT



Basic Exercise

1. Lift your outer leg as high as possible laterally (to the side) but not above the level of the water.
2. Lower the leg downward and across the *front* of the supporting leg as far as possible.
3. Repeat the lift motion as in #1. This time lower the leg downward and across the *back* of the supporting leg. Don't be surprised if your leg cannot reach as far as the pool wall.
4. Repeat with equal force in both directions.
5. Reverse body position and repeat exercise with other leg.

LEG CIRCLES



Basic Exercise

1. With leg straight, begin a clockwise circular motion. The circular pattern being made by the foot should be at least 24" in diameter. Repeat.
2. Repeat movement in counterclockwise direction.
3. Repeat #1 and #2 with other leg.

Reminder

Keep your buttocks pressed to the wall and legs straight

Variation

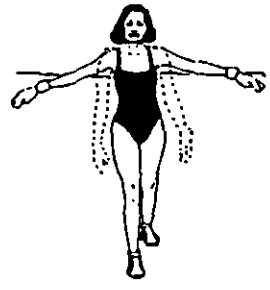
Repeat above exercise with a smaller motion (6 to 8"). Increase the speed of the circular movement.

ARM EXERCISES/RESISTANCE

All exercise descriptions and pictures:

Gaines, M. P. (1993). Fantastic water workouts. Champaign, IL: Human Kinetics.

Side Arm Pump



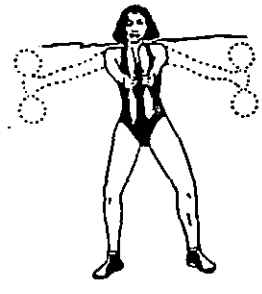
Action:

1. Slowly lift both arms out to your sides, palms up, toward the water's surface.
2. Slowly press both arms down to your sides, palms down.

Repeat 8 to 16 times.

Safety Tips: Keep your hands under water throughout the entire exercise. For greater stability, perform one arm at a time, holding on to the pool edge with your side toward the pool wall. Minimize this exercise by reducing speed and repetitions if you have neck pain.

Chest/Upper Back Glide



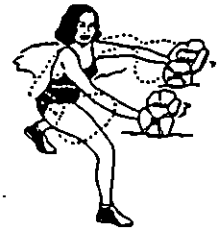
Action:

1. Extend both arms out to [illegible] palms facing forward.
2. Press both palms in toward one another out in front of your chest.
3. Turn your palms around and press back until your hands are even with your back.

Turn your palms around and repeat the sequence for 8 to 16 repetitions.

Safety Tip: For greater stability, perform one arm at a time, holding on to the pool edge with your side toward the wall.

Chest/Back Press



Action:

1. Press the disk, board, or your hands out in front of your chest under water. Contract the muscles over your shoulder blades and keep them contracted during the entire exercise.
2. Pull the disk, board, or your hands back toward your rib cage, bringing your elbows along your sides to a comfortable point behind your waist. Use the muscles of your mid back.

Repeat 8 to 16 times.

Safety Tips: When you straighten your arms, keep a slight bend at the elbow to protect the elbow joint. Hold your abdominals firmly to stabilize your torso. For greater stability, perform one arm at a time, holding on to the pool edge, your side toward the wall.

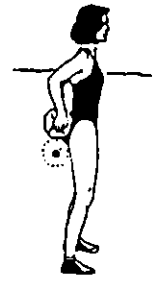
Diagonal Front Shoulder Press

Action:

1. Press your right palm down and across your body toward your left thigh.
2. Lift your arm up toward the pool surface to return to the starting position.

Repeat eight times. Then switch your position with a pivot turn and repeat eight times.

Behind-the-Back Press

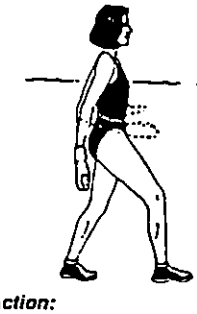


Action:

1. Keeping your hands behind you, bend your elbows and lift your hands upward toward your waist.
2. Press your hands back down.

Repeat eight times.

Upper Arm Curls



Action:

1. Bend your elbows. Keeping your upper arms motionless, press your palms upward toward the surface of the pool in an arc. Avoid lifting your hands out of the water.
2. Turn your palms toward the pool bottom and press down and back.

Repeat 8 to 16 times.

Safety Tips: Keep a slight bend in the elbow when you extend to protect the elbow joint. If you are using water exercise bells or paddles, you will not need to turn your hand around between Steps 1 and 2. For greater stability, perform poolside, one arm at a time, holding on to the pool edge.

APPENDIX F

Functional Capacity Scorecard

How Much Does Arthritis Interfere With My Ability to Lead a Normal, Independent Life?

This functional capacity scoring system for arthritis patients was developed at Stanford University by Dr. James F. Fries. Make photocopies of this empty chart, for you should do this self-evaluation once a month.

I can do the following tasks (fill in score on line)	... without difficulty.	... with difficulty.	... with some help from someone else.	... I can't do it at all.
Dressing and Grooming				
Get my clothes out of the closet and drawers	0	1	2	3
Dress myself, including the handling of buttons, zipper, snaps, and so forth	0	1	2	3
Shampoo my hair	0	1	2	3
	Total	Total	Total	Total
				Dressing/grooming total

I can do the following tasks (fill in score on line)	... without difficulty.	... with difficulty.	... with some help from someone else.	... I can't do it at all.
Arising				
Stand up from a straight chair without using my arms for support	0	1	2	3
	Total	Total	Total	Total
				Arising total
Eating				
Cut the meat on my plate	0	1	2	3
Lift a full cup or glass to my mouth	0	1	2	3
	Total	Total	Total	Total
				Eating total
Walking				
Walk outdoors on flat ground	0	1	2	3
	Total	Total	Total	Total
				Walking total
Hygiene				
Wash and dry my entire body	0	1	2	3
Use the bathtub	0	1	2	3

I can do the following tasks (fill in score on line)	**... without difficulty.**	**... with difficulty.**	**... with some help from someone else.**	**... I can't do it at all.**
Hygiene (cont.)				
Turn faucets on and off	0	1	2	3
Get on and off the toilet	0	1	2	3
	Total	Total	Total	Total
				Hygiene total
Reaching				
Comb my hair	0	1	2	3
Reach for and get down a 5-pound bag of sugar that is above my head	0	1	2	3
	Total	Total	Total	Total
				Reaching total
Gripping				
Open push-button car doors	0	1	2	3
Open jars that have been previously opened	0	1	2	3
Use a pen or pencil	0	1	2	3
	Total	Total	Total	Total
				Gripping total

I can do the following tasks (fill in score on line)	... without difficulty.	... with difficulty.	... some help from someone else.	... I can't do it at all.
Outside activities				
Drive a car (if I drive at all)	0	1	2	3
Run errands and shop	0	1	2	3
	Total	Total	Total	Total
				Outside activities total
				Total for all 8 categories

Over the course of several months you'll be able to evaluate whether your functional capacity is improving or going downhill. If your scores are getting consistently worse, I suggest you talk to your doctor about altering your treatment program.